

SOLAR EVAPORATION PONDS

CLOSURE PLAN

**U.S. DEPARTMENT OF ENERGY
ROCKY FLATS PLANT
GOLDEN, COLORADO**

JULY 1, 1988

VOL. III

**ROCKWELL INTERNATIONAL
NORTH AMERICAN SPACE OPERATIONS
ROCKY FLATS PLANT**

REVIEWED FOR CLASSIFICATION/UCNI

By F. J. Curran

Date 4-3-91

**DEPARTMENT OF ENERGY
ALBUQUERQUE OPERATIONS OFFICE
ENVIRONMENT, SAFETY AND HEALTH DIVISION
ENVIRONMENTAL PROGRAMS BRANCH**

**COMPREHENSIVE ENVIRONMENTAL ASSESSMENT
AND RESPONSE PROGRAM**

**PHASE 2:
ROCKY FLATS PLANT
SITE-SPECIFIC MONITORING PLAN
(Work Plan for Performance of Remedial Investigations and
Feasibility Studies for all High-Priority Sites)**

SAMPLING PLAN

February 1987

DRAFT

APPENDIX A
SAMPLING PLAN

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1. INTRODUCTION

CEARP Phase 2 Confirmation consists of CEARP Phase 2a, Monitoring Plan, and CEARP Phase 2b, site characterization (remedial investigation). The Sampling Plan is one component of the Monitoring Plan for Rocky Flats Plant. The Monitoring Plan typically consists of five parts: Synopsis, Sampling Plan, Technical Data Management Plan, Health and Safety Plan, and Quality Assurance/Quality Control (QA/QC) Plan. Because of the Compliance Agreement made by the State of Colorado, Environmental Protection Agency, and Department of Energy (DOE), this Monitoring Plan also includes a Feasibility Study Plan.

CEARP uses a three-tiered approach in the preparation of monitoring plans: the CEARP Generic Monitoring Plan, the Installation Generic Monitoring Plan (IGMP), and Site Specific Monitoring Plans (SSMPs). This SSMP serves as the Work Plan for Performance of Remedial Investigations and Feasibility Studies for all High-Priority Sites required by the Compliance Agreement. Therefore, the acronym used to refer to this plan is SSMP/RIFS. This Rocky Flats Plant SSMP/RIFS Sampling Plan is the detailed work plan for implementation of CEARP Phase 2b site characterizations (remedial investigations) at Rocky Flats Plant and follows guidance provided in the IGMP/CSPCP. This SSMP/RIFS Sampling Plan is complemented by and inseparable from the Technical Data Management Plan and the Quality Assurance/Quality Control Plan. Sections of the Sampling Plan are supported by reference to the other plans and to the Synopsis. Emphasis is placed on integration of efforts for each of the CEARP Phases: Phase 3 (Technological Assessment), Phase 4 (Remedial Action), and Phase 5 (Compliance Verification and Monitoring).

Sampling at Rocky Flats Plant will be conducted using the integrated approach being implemented by CEARP. The integrated approach is summarized in the Synopsis and detailed here. The integrated approach includes characterization in stages, in which the results from the previous stage of sampling are used to design the next stage. This iterative process incorporates the experience and knowledge gained from each stage to minimize the total number of samples required to adequately characterize the site and to provide the necessary data base to prepare feasibility studies for alternative remedial actions. The benefit of staged sampling is greater flexibility within the sampling program with a minimum of cost.

1.1. PURPOSE

This SSMP/RIFS Sampling Plan provides the following basic components of sample/measurement collection and analysis for each high-priority site at Rocky Flats Plant:

- objectives and goals of the investigation
- justification for selected methods and procedures
- proposed sample locations
- proposed number and type of samples
- additional site-specific information requirements.

1.2. OBJECTIVES

The objectives of CEARP Phase 2b site characterizations (remedial investigations) at the high-priority sites at Rocky Flats Plant are to

- verify and characterize contaminant sources,
- determine the present areal and vertical extent of contamination,
- estimate the potential for contaminant migration (including rate and direction) to support risk assessment studies,
- support the technological assessments (feasibility studies) of alternative response actions, including the alternative of "no action," and
- support identification of long term monitoring and verification requirements, as appropriate.

2. SITE SURVEY AND MAPPING

Following the guidance in the IGMP/CSPCP Sampling Plan, all monitoring locations will be described in accordance with the Installation Coordinate System (ICS) for Rocky Flats Plant. The existing coordinate system is a grid system in English units (feet). Elevations will be described in English units, feet above MSL. Surveying will be done in conformance with surveying procedures established in the IGMP/CSPCP.

3. SITE-SPECIFIC MONITORING

Environmental conditions at Rocky Flats Plant have been monitored since shortly after operations began in 1952. In addition, special programs to characterize waste streams, environmental conditions, and past waste disposal practices have been conducted recently (DOE 1986b and DOE 1986f). CEARP Phase I identified approximately 70 sites or groupings of sites that could have adverse impacts on the environment. Additional data collected during preparation of the RCRA Part B Operating Permit Application identified several more potential sites. All potential sites at Rocky Flats Plant were designated as solid waste management units, assigned a reference number, and located on a base map (IGMP/CSPCP Sampling Plan, Plate 1).

A list of solid waste management units is presented in Appendix I of the RCRA Part B Operating Permit Application (3004[u] Waste Management Units) (DOE 1986f). These solid waste management units are divided into three categories. The first category includes those hazardous waste management units which will continue to operate and which require a RCRA Operating Permit. The second category includes those hazardous waste management units which are being closed under RCRA Interim Status. The third category includes those inactive waste management units (i.e., RCRA continuing release sites) that are identified under Section 3004(u) of RCRA. Another class of sites is regulated under CERCLA. These CERCLA areas identified at Rocky Flats Plant contain only radioactive wastes (DOE 1986f). However, for ease in referencing these units and/or areas, they have been collectively termed solid waste management units. A preliminary prioritization of solid waste management units based on the CEARP Phase I Installation Assessment was performed and summarized in a report titled "Preliminary Prioritization of Sites" (DOE 1986h).

The high-priority sites addressed in this SSMP/RIFS Monitoring Plan were selected and designated as high-priority sites because of their suspected relationship to preliminarily-identified contaminant plumes in groundwater. Several solid waste management units are included in most of the high-priority sites (Table 3.1 Synopsis) because of their physical proximity to each other. This results in high-priority sites that contain solid waste management units from various phases of CEARP. This is consistent with the staged approach being used by CEARP for site characterizations

(remedial investigations), where the higher priority solid waste management units within the high-priority sites are investigated first, and data from these characterizations (investigations) guide the remainder of the program.

The six high-priority sites identified at Rocky Flats Plant (Plate 1) are as follows:

- 881 Hillside Site
- 903 Pad Area Site
- Mound Area Site
- East Burial Trenches Site
- Present Landfill Site
- Solar Evaporation Ponds Site

The solar ponds and present landfill are RCRA regulated units undergoing closure. Plans for characterization of these sites have been incorporated into this SSMP and are consistent with the 40 CFR 265 Closure Plans for these facilities.

The three viable pathways for releases of contaminants from Rocky Flats Plant are air, surface water, and groundwater (DOE 1986b). Air pathway characterization studies will not be performed under CEARP, as the air pathway has been adequately characterized and documented by previous studies (DOE 1986b, RI 1986b). A site-specific discussion of the other pathways at each high-priority site is presented after each site description. A plant-wide discussion of pathways is presented in the SSMP/RIFS Synopsis.

Investigations at each high-priority site can be divided into source characterization, and migration pathway and plume characterization. Source characterization will generally consist of geophysical surveys, soil gas surveys and soil/waste sampling. Migration pathway and plume characterization will generally include geophysical surveys, soil gas surveys, soil sampling, monitor well installation, groundwater sampling, and surface water and sediment sampling. All CEARP Phase 2b site characterizations (remedial investigations) will be implemented using an integrated approach, in which geophysical and soil gas survey results are used to direct soil and groundwater sampling efforts.

Invasive sampling will be performed at many of the high-priority sites. General criteria that are considered in the sampling descriptions of this plan are as follows:

- If the solid waste management unit cannot be located through geophysical techniques, its suspected location will be sampled.
- Invasive samples from a solid waste management unit will be taken only if the presence of containers of liquid or other hazardous conditions is not anticipated.
- At least six samples will be submitted for laboratory analysis from each borehole depending on the amount of available material. The reader is referred to Section 6 of the IGMP Sampling Plan for rationale.

The following sections present high-priority site descriptions including discussions of associated solid waste management units and migration pathways, followed by detailed plans for source and migration pathway and plume characterization. Complete descriptions of the solid waste management units are contained in the RCRA Part B Operating Permit, Appendix 1 (DOE 1986f).

3.6. SOLAR EVAPORATION PONDS SITE

3.6.1. Site Description

3.6.1.1. Solid Waste Management Unit Descriptions

The Solar Evaporation Ponds Site consists of three separate ponds (SWMU Ref. No. 101): 207C (western pond), 207A (central pond), and 207B (eastern pond). Pond 207B is separated into three sectors (north, central and south). Ponds 207A and 207C contain low-level radioactive liquid process wastes (high in nitrates) being held for evaporation, treatment and solidification. Pond 207B North receives groundwater pumped from the interceptor trench north of the solar ponds. Pond 207B Center contains treated sanitary wastewater from the treatment plant. Pond 207B south is currently empty.

The solar evaporation ponds were constructed in separate phases between 1953 and 1970. Originally, the solar evaporation ponds were a single, two-celled, clay-lined impoundment near Building 779. This pond held low-level radioactive process wastes (high in nitrates) and effluent (mostly water) from treatment of acidic liquid wastes in Building 774. The original pond was used regularly from 1953 through 1965 and was removed as part of the construction of pond 207C. The effluent from the acidic waste treatment process was thick with aluminum hydroxide and difficult to filter. Therefore, an additional pond, 207A, was constructed in 1956 to hold the effluent prior to solidification and shipment offsite. Leakage problems developed in the planking and asphalt-lined ponds, so the three 207B ponds were constructed in 1960. The 207B ponds were also lined with planking and asphalt and eventually began to leak. The liners were repeatedly patched with various materials. In 1970, all of the ponds (207A and 207B) were full, so pond 207C was constructed for additional storage and evaporative potential. Pond 207C was constructed on the site of the original clay lined pond.

In addition to the high nitrate, low-level radioactive process waste and the treated aluminum hydroxide waste, the solar evaporation ponds have received sanitary sewage sludge, lithium metal, sodium nitrate, ferric chloride, lithium chloride, sulfuric acid, ammonium persulfate, hydrochloric acid, nitric acid, hexavalent

chromium and cyanide solutions. To the greatest extent possible, oils and solvents were not sent to the ponds so that surface scum would not hamper evaporation.

A series of trenches and drains was constructed on the north facing slope below the ponds to collect leakage between 1971 and 1981. Because of various construction projects in the area, only the most recent french drain, constructed in 1981, is functional. This system more than covers the east-west dimensions of the ponds and appears to be effective in collecting the seepage.

3.6.1.2. Surface Water

Surface water flows to both North and South Walnut Creeks from the solar evaporation ponds area. The northern slope of the solar evaporation ponds and the units in the 700 area drain toward the north (North Walnut Creek). Most of the runoff is contained by the perimeter road and enters the groundwater interceptor system which extends to the surface. The triangle area (SWMU ref. no. 165) drains directly to North Walnut Creek through a culvert. Runoff from the triangle area is collected in the A-series retention pond system. The southern areas of the solar evaporation ponds drain toward South Walnut Creek and runoff is collected in the B-series retention ponds.

3.6.1.3. Groundwater

Groundwater occurs in both the Rocky Flats Alluvium and in bedrock materials in the vicinity of the solar evaporation ponds. The Rocky Flats Alluvium varies in thickness from about 5 to 12 ft beneath the terrace, and the ponds themselves are probably underlain by a thin veneer of Rocky Flats Alluvium. The top of bedrock forms a mild structural ridge that trends down to the east-northeast. The northern slope from the ponds toward North Walnut Creek has been extensively reworked and most of the unconsolidated materials have been removed (claystone bedrock is exposed over much of the slope). The alluvium extends to the east along the ridge, although it is fully penetrated by the perimeter road.

Bedrock immediately beneath the Rocky Flats Alluvium in the vicinity of the solar evaporation ponds consists of claystone and sandstone of the Arapahoe Formation. Twelve borings have been made in the immediate vicinity of the ponds, and

sandstone comprises roughly 20 percent or less of the bedrock materials within 150 ft of the surface. The beds dip approximately 15 degrees to the east.

Alluvial groundwater flow in the vicinity of the ponds is generally to the north. There appears to be an area of unsaturated alluvium south of the ponds (Hurr 1976 and DOE 1986f) that indicates no flow in the alluvium to the south. The alluvium is fully penetrated by the perimeter road east of the ponds. There is no spring at the outcrop; therefore, there is no alluvial groundwater flow to the east. In addition, claystone bedrock is exposed on the slope to the north of the ponds. It appears that the alluvium beneath the ponds is recharged by subsurface flow from the west, and that the discharge is to the north in the form of subsurface flow in surficial materials and overland flow over the exposed claystone bedrock. Most, if not all of this water appears to be collected in the interceptor trench system.

Flow in bedrock is less well defined. Regional studies (Hurr 1976 and Robson 1981) indicate relatively shallow gradients of about 0.03 to the east (downdip). Site-specific data are currently lacking. However, it seems likely that there is a gradient to the east plus a gradient along the strike in the near-surface, controlled by topography. In addition, there is a downward gradient between the surficial materials and bedrock of about 0.3 in areas of continuous saturation between the two materials. It appears that there is not continuous saturation between the two materials at the eastern and southern edges of the ponds. These areas of discontinuous saturation between the materials are on the edges of alluvium saturation, where water is not always available to recharge the bedrock system.

Groundwater quality in surficial materials in the vicinity of the solar evaporation ponds is characterized by high TDS concentrations, high nitrate concentrations, high strontium concentrations, and possibly elevated radionuclides. Volatile organic compounds have been detected intermittently near the solar evaporation ponds.

3.6.2. Source Characterization

3.6.2.1. Geophysical Surveys

Geophysical surveys will not be performed at the Solar Evaporation Ponds Site; the pond locations are well defined.

3.6.2.2. Soil Gas Surveys

Soil gas surveys will not be conducted at the Solar Evaporation Ponds Site; the pond locations are well defined.

3.6.2.3. Soil/Waste Sampling

The liquids in the ponds and the sludges in Pond 207A have been adequately characterized by previous investigations (DOE 1986f). The sediments in the 207B ponds and in Pond 207C will be sampled during CEARP Phase 2 investigations. Soil sampling around the solar evaporation ponds will be conducted to evaluate the extent of soil contamination and is discussed in Section 3.6.3.2.

3.6.3. Migration Pathway and Plume Characterization

3.6.3.1. Soil Gas Surveys

Soil gas surveys will not be performed at the Solar Evaporation Ponds Site. Detailed soil and groundwater sampling at the site adequately defines groundwater plumes.

3.6.3.2. Soil Sampling

Soils on the berms of the solar evaporation ponds and on the hillside north of the ponds will be sampled to evaluate the extent of soil contamination. Approximately 20 borings are anticipated (Plate 3). Three borings will be located on the eastern berm of pond 207B, two borings will be drilled into the berm between ponds 207A and 207B, and two borings will be located on the berm between ponds 207A and 207C. Another six boreholes will be drilled on the hillside north of the solar evaporation ponds. Borings will extend to the water table or to the top of bedrock if top of bedrock is above the water table.

Soil sampling will be implemented in phases. After analyzing results from soil sampling on the pond berms and the north hillside, another 7 to 10 soil borings may

be drilled downgradient of the ponds outside the perimeter security zone. These borings may extend down the hillside to North Walnut Creek to delineate areas of contaminated soil. Soil sampling and analysis details will be provided in the revised Solar Evaporation Ponds Closure Plan.

3.6.3.3. Monitor Well Installation and Groundwater Sampling

Twenty-two new monitor wells were drilled around the solar evaporation ponds as part of the initial CEARP Phase 2b site characterization (remedial investigation). This monitoring system rings the solar evaporation ponds with alluvial and bedrock wells. In addition, there are several alluvial and bedrock monitor wells downgradient of the ponds in both North and South Walnut Creeks.

Because of the extensive groundwater monitoring system already in place at the solar evaporation ponds, only two new monitor wells are proposed downgradient of the ponds (Plate 4). One well will be installed in North Walnut Creek immediately north of existing well 13-86 to characterize groundwater flow in the North Walnut Creek valley fill alluvium. Another well will be located on the hillside north of the ponds.

3.6.3.4. Surface Water and Sediment Sampling

Surface water samples will be collected from established sampling locations up and downstream from the Solar Evaporation Ponds Site. Included will be stations along North Walnut Creek and South Walnut Creek. Surface water samples will also be collected from any springs or seeps occurring on the hillsides north of the solar evaporation ponds. Samples will be analyzed for the parameters in Tables 3.1 and 3.2 as appropriate.

Table 3.1. Source Sampling Parameters

Metals^{a,b}

Hazardous Substance List - Metals

Beryllium

Chromium (hexavalent)

Lithium

Strontium

Organics

Hazardous Substances List - Volatiles^b

Oil and Grease^a

Radionuclides^b

Gross Alpha

Gross Beta

Uranium 233, 234, and 238

Americium 241

Plutonium 239

Strontium 90

Cesium 137

Tritium

Other

TCLP

EP Toxicity

Characteristics (e.g., ignitability, corrosivity, reactivity)

pH

Cation Exchange Capacity

^aThese analyses will be performed on only one-third of the samples.

^bThese analyses may be performed on sediments.

Table 3.2. Groundwater and Surface Water Sampling Parameters

Field Parameters

pH
Specific Conductance
Temperature
Dissolved Oxygen*

Indicators

Total Dissolved Solids
Total Suspended Solids*

Metals**

Hazardous Substances List - Metals***

Beryllium***

Calcium

Chromium (hexavalent)***

Iron

Lithium***

Magnesium

Manganese

Potassium

Sodium

Strontium***

Zinc

Anions

Carbonate

Bicarbonate

Chloride

Sulfate

Nitrate

Organics

Hazardous Substances List - Volatiles

Oil and Grease***

Radionuclides

Gross Alpha

Gross Beta

Uranium 233, 234, and 238

Americium 241

Plutonium 239

Strontium 90

Cesium 137

Tritium

Table 3.2. (Continued)

Other
EP Toxicity
Characteristics (e.g., ignitability, corrosivity, reactivity)

-
- for surface water samples only
 - ** dissolved metals for groundwater samples,
total and dissolved metals for surface water samples
 - ***These analyses will be performed on only one-third of the samples.

4. SAMPLE CONTAINERS, PRESERVATION, AND HOLDING TIMES

Protocols for sample containers, sample preservation, and holding times will conform to those specified in the CGMP and IGMP/CSPCP Sampling Plans and Quality Assurance/Quality Control Plans.

5. SAMPLE CONTROL AND DOCUMENTATION

Procedures for sample control and documentation will conform to those specified in the CGMP and IGMP/CSPCP Quality Assurance/Quality Control Plans.

6. SAMPLE HANDLING, TRANSPORT, AND STORAGE

Procedures for sample handling, transport, and storage will conform to those specified in the CGMP and IGMP/CSPCP Quality Assurance/Quality Control Plans.

7. SAMPLE PREPARATION AND ANALYSES

Procedures for sample preparation and analyses will conform to those specified in the CGMP and IGMP/CSPCP Quality Assurance/Quality Control Plans.

8. REFERENCES

- DOE 1986b: "Comprehensive Environmental Assessment and Response Program Phase 1: Draft Installation Assessment Rocky Flats Plant," US Department of Energy unnumbered draft report, April 1986.
- DOE 1986f: "Resource Conservation and Recovery Act Part B - Operating Permit Application for USDOE Rocky Flats Plant, Hazardous and Radioactive Mixed Wastes," US Department of Energy unnumbered report, November 1986.
- DOE 1986g: "Resource Conservation and Recovery Act Part B - Post-Closure Care Permit Application for USDOE Rocky Flats Plant, Hazardous and Radioactive Mixed Wastes," US Department of Energy unnumbered report, November 1986.
- DOE 1986h: "Draft Preliminary Prioritization of Sites," US Department of Energy unnumbered draft report, July 1986.
- Hurr 1976: R.T. Hurr, "Hydrology of a Nuclear-Processing Plant Site, Rocky Flats, Jefferson County, Colorado," US Geological Survey Open-File report 76-268, 1976.
- RI 1986a: "Annual Environmental Monitoring Report: January-December 1985," Rockwell International Rocky Flats Plant, Golden, Colorado report RFP-ENV-85, April 1986.
- RI 1986b: "Rocky Flats Plant Radioecology and Airborne Pathway Summary Report," Rockwell International, Rocky Flats Plant, Golden, Colorado unnumbered report, December 1986.
- Robson 1981: Robson, S.G., J.C. Romero and S. Jawistowski, "Geologic Structure, Hydrology, and Water Quality of the Arapahoe Aquifer in the Denver Basin, Colorado," US Geologic Survey Hydrologic Atlas HA-647, 1981.

APPENDIX B
HYDROGEOLOGIC DATA

EXPLANATION OF SYMBOLS AND TERMS
ON BORING LOGS

SAMPLE TYPE



Split Spoon



NC Core

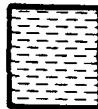


Continuous Drive



Bulk

GRAPHIC LOG



Clay or Claystone



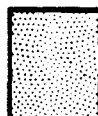
Clayey Sand or Sandy Clay



Silty Claystone



Cobbles, Gravel and/or Boulders



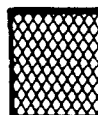
Sand and Sandstone



Sand and Gravel



Silt or Siltstone



Artificial Fill / Disturbed Ground

APPENDIX B-1
1986 MONITOR WELLS

INDEX OF DATA

Boring No.: 4-86

Completed as well? Yes

Data in File

- ☒ Log of Borehole
- ☒ Well Construction Summaries
- ☒ Well Development Summaries
- ☐ Hydraulic Conductivity Test Data and Results
- ☐ Packer Test Data and Results
- ☒ Water Level Data
- ☐ Saturated Thickness Hydrographs

| | | | | | | | |
|--|--|--|--|--------------------------------------|--|--|--|
| Project: Rocky Flats Plant | | | | LOG OF BORING NO. 4-86 | | | |
| Date Drilled 4/24/86 | | | | Coordinates | | | |
| Boring Method Hollow Stem Auger | | | | Ground Surface Elevation 5645 | | | |

| Elev. (feet) | Depth (feet) | Sample Type | Graphic Log | Material Description | Penetration Resistance (Blows/Inch) | | Water Content (%) | | Other Tests |
|-----------------|-----------------|----------------|----------------|---|---|----|-------------------------|----|----------------|
| | | | | | 20 | 40 | 20 | 40 | |
| | 0 | | | VALLEY FILL ALLUVIUM 0-0.7'. CLAY: dark brown; silty; trace granitic pebbles; moist. 0.7-1.5'. CLAY: medium to dark brown; some very fine-grained sand; moist. 1.5-2.7'. SAND: medium to dark brown; poorly sorted; fine to coarse; quartz and feldspar; silty clay partings; moist. 2.7-3.0'. CLAY: dark grayish brown; iron stains and trace granitic pebbles; silty; moist to wet. 3.0-8.0'-Sample. Recovered 1.7/5.0'=34%. 3.0-4.0'. CLAY: Same as above; moist to wet. 6.3-8.0'. CLAY: dark grayish brown; silty; iron stains and trace granitic pebbles; moist to wet. 8.0-10.5'-Sample. Recovered 0.7/2.5'=28%. 8.0-8.7'. CLAY: dark brown; silty; trace grading to some granitic cobbles; moist. 10.5-13.0'-Sample. Recovered 1.3/2.5'=52%. 11.7-12.2'. CLAY: medium to dark brown; some granitic pebbles and cobbles; sandy to gravelly; moist. Wet at 12.0'. 12.2-13.0'. CLAY: medium brown to medium gray; sandy to gravelly; some granitic pebbles and cobbles; iron staining; wet. | | | | | |
| | 3 | | | | | | | | |
| | 6 | | | | | | | | |
| | 9 | | | | | | | | |
| | 12 | | | | | | | | |

| | | | |
|--------------------------------------|--|--------------------|--|
| Remarks Logged by: S. Paschke | | Checked by: | |
|--------------------------------------|--|--------------------|--|

| | | |
|---------------------------------|---------------------------|-------------|
| Project No. 106P06222 | Hydro-Search, Inc. | Page 1 of 2 |
|---------------------------------|---------------------------|-------------|

| | | | | | | | |
|--|--|--|--|--------------------------------------|--|--|--|
| Project: Rocky Flats Plant | | | | LOG OF BORING NO. 4-86 | | | |
| Date Drilled 4/21/86 | | | | Coordinates | | | |
| Boring Method Hollow Stem Auger | | | | Ground Surface Elevation 5645 | | | |

| Elev. (feet) | Depth (feet) | Sample Type | Graphic Log | Material Description | Penetration Resistance (Blows/Inch) 20 40 | Water Content (%) 20 40 | Other Tests |
|-----------------|-----------------|----------------|----------------|--|--|----------------------------------|----------------|
| | 12 | | | 13.0-15.5'-Sample. Recovered 2.1/2.5'=84%. 13.0-14.7'. CLAY: medium gray; some fine to coarse sand and some granitic pebbles; iron staining; wet. 14.7-14.9'. CLAY: medium gray; some fine to coarse sand and granitic pebbles; iron staining; wet. ARAPAHOE FORMATION 15.5-18.0'-Sample. Recovered 2.5/2.5'=100%. CLAYSTONE: medium gray; slightly sandy; moist. | | | |
| | 15 | | | | | | |
| | 18 | | | | | | |
| | | | | TOTAL DEPTH: 18.0' | | | |
| | 21 | | | | | | |
| | 24 | | | | | | |

| | | |
|----------------|-----------------------|-------------|
| Remarks | Logged by: S. Paschke | Checked by: |
|----------------|-----------------------|-------------|

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|---------------------------------|---------------------------|-------------|
| Project No. 106P06222 | Hydro-Search, Inc. | Page 2 of 2 |
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WELL CONSTRUCTION SUMMARY

LOCATION or COORDS: N 40437.1 E 30774.2

ELEVATION: GROUND LEVEL 5636.60'
TOP OF CASING 5637.94'

DRILLING SUMMARY:

TOTAL DEPTH Well: 14.92' Hole: 18.00'

BOREHOLE DIAMETER 7 1/4"

DRILLER Boyles Brothers Drilling Co.
15865 W. 5th Avenue
Golden, CO (Doyle Styles)

RIG Mobile B-57

BIT(S) Blade bit

DRILLING FLUID None

SURFACE CASING 5" x 4' steel w/ locking cap

WELL DESIGN:

BASIS: GEOLOGIC LOG X GEOPHYSICAL LOG

CASING STRING(S): C=CASING S=SCREEN

0.00' 3.52' C1

3.52' - 14.92' SI

CASING: C1 2" I.D. Sch. 5 type 316 stain-
less steel, threaded and flush
jointed.

SCREEN: SI 2" I.D. Sch. 5 type 316 stain-
less steel, threaded and flush
jointed, 0.020" wire wrap screen,
0.25' welded bottom cap.

CENTRALIZERS Centralizer placed approxi-
mately mid-point on screened interval.

FILTER MATERIAL 12-20 silica sand
2.40' - 18.00'

CEMENT Portland Type I
0.00' - 1.95'

OTHER 3/8" bentonite pellets
1.95' - 2.40'

CONSTRUCTION TIME LOG:

| <u>TASK</u> | <u>START</u> | | <u>FINISH</u> | |
|---------------------|---------------------|-------------|---------------------|-------------|
| | <u>DATE</u> 1986 | <u>TIME</u> | <u>DATE</u> 1986 | <u>TIME</u> |
| DRILLING: | | | | |
| <u>7½" auger</u> | <u>4/24</u> | <u>1440</u> | <u>4/24</u> | <u>1600</u> |
| _____ | _____ | _____ | _____ | _____ |
| _____ | _____ | _____ | _____ | _____ |
| GEOPHYS. LOGGING: | <u>—</u> | <u>—</u> | <u>—</u> | <u>—</u> |
| CASING: | | | | |
| <u>2" stainless</u> | <u>4/24</u> | <u>1725</u> | <u>4/24</u> | <u>1730</u> |
| _____ | _____ | _____ | _____ | _____ |
| _____ | _____ | _____ | _____ | _____ |
| FILTER PLACEMENT: | <u>4/24</u> | <u>1730</u> | <u>4/24</u> | <u>1810</u> |
| CEMENTING: | <u>4/25</u> | <u>1010</u> | <u>4/25</u> | <u>1020</u> |
| DEVELOPMENT: | <u>8/29</u> | <u>1606</u> | <u>8/29</u> | <u>1606</u> |
| OTHER: | | | | |
| <u>Bentonite</u> | <u>4/25</u> | <u>1000</u> | <u>4/25</u> | <u>1010</u> |
| _____ | _____ | _____ | _____ | _____ |
| _____ | _____ | _____ | _____ | _____ |
| _____ | _____ | _____ | _____ | _____ |
| _____ | _____ | _____ | _____ | _____ |

WELL DEVELOPMENT

See Well Development Summary Sheet.

COMMENTS:

Water encountered at 12.00' during drilling

Top of stainless steel casing: 1.34'

WELL DEVELOPMENT SUMMARY SHEET

[illegible]

ROCKY FLATS SOLAR PONDS

WATER LEVEL SUMMARY

| <u>WELL</u> <u>NUMBER</u> | <u>DATE</u> | <u>GROUND</u> <u>SURFACE</u> <u>ELEVATION</u> | <u>TOP OF</u> <u>CASING</u> <u>ELEVATION</u> | <u>STICK</u> <u>UP</u> | <u>DEPTH</u> <u>OF SI</u> <u>BASE</u> | <u>WATER</u> <u>DEPTH</u> <u>BELOW TOC</u> | <u>WATER</u> <u>SURFACE</u> <u>ELEVATION</u> |
|------------------------------|-------------|---|--|---------------------------|---|--|--|
| 0486 | 08/29/86 | 5636.60 | 5637.94 | 1.34 | 14.92 | -1.00 | DRY |
| | 10/13/86 | | | | | -1.00 | DRY |
| | 11/26/86 | | | | | -1.00 | DRY |
| | 01/01/87 | | | | | -1.00 | DRY |
| | 02/23/87 | | | | | 7.21 | 5630.73 |
| | 04/01/87 | | | | | 5.54 | 5632.40 |
| | 05/07/87 | | | | | 5.54 | 5632.40 |
| | 06/02/87 | | | | | 6.60 | 5631.34 |
| | 07/08/87 | | | | | 7.45 | 5630.49 |
| | 08/04/87 | | | | | -1.00 | DRY |
| | 08/10/87 | | | | | -1.00 | DRY |
| | 09/01/87 | | | | | -1.00 | DRY |
| | 10/01/87 | | | | | -1.00 | DRY |
| | 11/09/87 | | | | | -1.00 | DRY |
| | 12/08/87 | | | | | -1.00 | DRY |
| | 01/07/88 | | | | | 7.20 | 5630.74 |
| | 02/24/88 | | | | | 6.30 | 5631.64 |
| | 03/07/88 | | | | | 6.50 | 5631.44 |
| | 04/11/88 | | | | | 6.80 | 5631.14 |

INDEX OF DATA

Boring No.: 11-86

Completed as well? Yes

Data in File

- ☒ Log of Borehole
- ☒ Well Construction Summaries
- ☒ Well Development Summaries
- ☐ Hydraulic Conductivity Test Data and Results
- ☐ Packer Test Data and Results
- ☒ Water Level Data
- ☐ Saturated Thickness Hydrographs

| | | | | | | | | |
|---------------------------------|--|--|--|--|--------------------------------|--|--|--|
| Project: Rocky Flats Plant | | | | | LOG OF BORING NO. 11-86 | | | |
| Date Drilled 9/5/86 | | | | | Coordinates | | | |
| Boring Method Hollow Stem Auger | | | | | Ground Surface Elevation 5723 | | | |

| Elev. (feet) | Depth (feet) | Sample Type | Graphic Log | Material Description | Penetration Resistance (Blows/Inch) 20 40 | Water Content (%) 20 40 | Other Tests |
|-----------------|-----------------|----------------|----------------|--|--|----------------------------------|----------------|
| | 0 | | | VALLEY FILL ALLUVIUM | | | |
| | | | | 0.0-2.0'-Sample. Recovered 2.0/2.0'=100%. | | | |
| | | | | 0.0-0.7'. SAND AND GRAVEL: Grayish brown (5YR 3/2); some granitic pebbles; roots and grasses common; poorly sorted; angular; unconsolidated; dry. | | | |
| | | | | 0.7-2.0'-Sample. GRAVEL: grayish brown (5YR 3/2) fine- to medium-grained sand and gravel; few roots; poorly sorted; subangular; unconsolidated; dry. | | | |
| | 2.5 | | | 2.0-3.0'-Sample. Recovered 1.0/1.0'=100%. | | | |
| | | | | GRAVEL: dark yellowish brown (10YR 4/2) with very coarse grained granitic pebbles; some red (5R 4/6) iron staining; poorly sorted; angular to subrounded; unconsolidated; dry. | | | |
| | | | | 3.0-6.0'-Sample. Recovered 0.0/3.0'=0%. | | | |
| | 5 | | | 6.0-8.0'-Sample. Recovered 0.8/2.0'=40% | | | |
| | | | | SAND: grayish red (5R 4/2) coarse to fine-grained with several quartzite and granite pebbles; poorly sorted; angular; unconsolidated; dry. | | | |
| | | | | 8.0-10.0'-Sample. Recovered 1.5/2.0'=75%. | | | |
| | 7.5 | | | 8.5-9.5'. SAND AND GRAVEL: dark yellowish brown (10YR 4/2) with gray quartzite pebbles; poorly sorted; angular; unconsolidated; dry. | | ▽ | |
| | | | | ARAPAHOE FORMATION | | | |
| | | | | 9.5-10.0'. CLAYSTONE: pale yellowish brown (10YR 6/2); slightly sandy; moderate yellowish brown (10YR 5/4) mottles; no pebbles; blocky texture; dry. | | | |
| | 10 | | | | | | |

| | | | |
|--------------------------|---------------------------|-----------------------|-------------------|
| Remarks | | Logged by: J. Bergman | Checked by: _____ |
| Project No. 106P06222 | Hydro-Search, Inc. | | Page 1 of 2 |

Project: Rocky Flats Plant

LOG OF BORING NO. 11-86

Date Drilled 9/5/86

Coordinates

Boring Method Hollow Stem Auger

Ground Surface Elevation 5723

| Elev. (feet) | Depth (feet) | Sample Type | Graphic Log | Material Description | Penetration Resistance (Blows/inch) | | Water Content (%) | | Other Tests |
|-----------------|-----------------|----------------|----------------|--|---|----|-------------------------|----|----------------|
| | | | | | 20 | 40 | 20 | 40 | |
| | 10 | | | 10.0-11.5'-Sample. Recovered 2.0/1.5'=125%. 10.0-10.5'. CLAYSTONE: dark yellowish brown (10YR 4/2); dry. | | | | | |
| | | | | 10.5-11.0'. CLAYSTONE: light olive gray (5Y 5/2) and dark yellowish brown (10YR 4/2) clay with moderate yellowish brown (10YR 5/4) mottles; consolidated; dry. | | | | | |
| | 12.5 | | | 11.0-11.5'. SANDSTONE: very light gray (N 8/0) with moderate brown (5YR 4/4) fine-grained to medium-grained sand; well sorted; rounded; consolidated; dry. | | | | | |
| | | | | 11.5-12.0'-Sample. Recovered 1.5/1.5'=100%. CLAYSTONE: moderate yellowish brown (10YR 5/4); dry. | | | | | |
| | 15 | | | 12.0-13.0'-Sample. Recovered 1.0/1.0'=100%. SANDSTONE: moderate brown (5YR 4/4) and light olive gray (5Y 5/2) very fine- grained to fine-grained sand; homogeneous; well sorted; rounded; well cemented; dry. | | | | | |
| | | | | 13.0-14.0'-Sample. Recovered 1.0/1.0'=100%. SANDSTONE: medium light gray (N 6/0) fine-grained sand; few black organic particles; well sorted; silica cement; Last 1.0" contains pale yellowish brown (10YR 6/2) and light brown (5YR 6/4) fine- grained to very fine- grained sand; rounded; no clay; dry. | | | | | |
| | 17.5 | | | 14.0-15.0'-Sample. Recovered 1.0/1.0'=100%. SANDSTONE: medium gray and medium light gray (N6/5) very fine-grained to fine-grained sand; some patches of pale yellowish brown (10YR 6/2) sand; well sorted; rounded; well cemented; dry. | | | | | |
| | 20 | | | TOTAL DEPTH: 15.0' | | | | | |

Remarks

Logged by: J. Bergman

Checked by: _____

Project No.

106P06222

Hydro-Search, Inc.

Page 2 of 2

WELL DEVELOPMENT SUMMARY SHEET

[illegible]

ROCKY FLATS SOLAR PONDS

WATER LEVEL SUMMARY

| WELL NUMBER | DATE | GROUND SURFACE ELEVATION | TOP OF CASING ELEVATION | STICK UP | DEPTH OF SI BASE | WATER DEPTH BELOW TOC | WATER SURFACE ELEVATION |
|----------------|----------|--------------------------------|-------------------------------|-------------|------------------------|-----------------------------|-------------------------------|
| 1186 | 09/08/86 | 5712.19 | 5714.75 | 2.56 | 10.25 | 10.43 | 5704.32 |
| | 09/09/86 | | | | | 9.85 | 5704.90 |
| | 09/10/86 | | | | | 10.18 | 5704.57 |
| | 09/11/86 | | | | | 9.77 | 5704.98 |
| | 09/13/86 | | | | | 9.75 | 5705.00 |
| | 09/17/86 | | | | | 10.54 | 5704.21 |
| | 09/18/86 | | | | | 10.85 | 5703.90 |
| | 09/24/86 | | | | | 6.17 | 5708.58 |
| | 10/13/86 | | | | | 10.60 | 5704.15 |
| | 11/26/86 | | | | | 9.43 | 5705.32 |
| | 01/01/87 | | | | | 9.46 | 5705.29 |
| | 03/02/87 | | | | | 8.02 | 5706.73 |
| | 04/01/87 | | | | | 5.60 | 5709.15 |
| | 05/07/87 | | | | | 4.88 | 5709.87 |
| | 06/01/87 | | | | | 8.27 | 5706.48 |
| | 07/08/87 | | | | | 8.50 | 5706.25 |
| | 07/30/87 | | | | | 9.40 | 5705.35 |
| | 08/04/87 | | | | | 9.70 | 5705.05 |
| | 09/28/87 | | | | | 10.00 | 5704.75 |
| | 11/03/87 | | | | | 10.00 | 5704.75 |
| | 12/08/87 | | | | | 10.00 | 5704.75 |
| | 01/06/88 | | | | | 9.80 | 5704.95 |
| | 02/24/88 | | | | | 7.70 | 5707.05 |
| | 03/14/88 | | | | | 7.90 | 5706.85 |
| | 04/11/88 | | | | | 7.70 | 5707.05 |

INDEX OF DATA

Boring No.: 12-86

Completed as well? Yes

Data in File

- ☒ Log of Borehole
- ☒ Well Construction Summaries
- ☒ Well Development Summaries
- ☒ Hydraulic Conductivity Test Data and Results
- ☐ Packer Test Data and Results
- ☒ Water Level Data
- ☐ Saturated Thickness Hydrographs

| | | | | | | | | | |
|--|--|--|--|--|--------------------------------------|--|--|--|--|
| Project: Rocky Flats Plant | | | | | LOG OF BORING NO. 12-86 | | | | |
| Date Drilled 9/6/86 | | | | | Coordinates | | | | |
| Boring Method Hollow Stem Auger | | | | | Ground Surface Elevation 5788 | | | | |

| Elev. (feet) | Depth (feet) | Sample Type | Graphic Log | Material Description | Penetration Resistance (Blows/inch) 20 40 | Water Content (%) 20 40 | Other Tests |
|-----------------|-----------------|-------------|-------------|---|--|----------------------------------|-------------|
| | 0 | | | VALLEY FILL ALLUVIUM 0.0-2.0'-Sample. Recovered 1.2/2.0'=60%. SAND: dark yellowish brown (10YR 4/2) very fine-grained sand and clay; trace gray quartzite pebbles; poorly sorted; angular; unconsolidated; moist. | | ▽ | |
| | 2.5 | | | 2.0-4.0'-Sample. Recovered 2.0/2.0'=100%. CLAY: dark yellowish brown (10YR 5/4) and moderate yellowish brown (10YR 4/2) with some quartzite and granite pebbles and cobbles; poorly sorted; angular; unconsolidated; damp. | | | |
| | 5 | | | 4.0-6.0'-Sample. Recovered 2.0/2.0'=100%. SAND: moderate yellowish brown (10YR 5/4) fine-grained sand and gray quartzite pebbles; poorly sorted; angular to subrounded; unconsolidated; damp. | | | |
| | 7.5 | | | 6.0-8.0'-Sample. Recovered 0.6/2.0'=30%. CLAY: moderate yellowish brown (10YR 5/4) clay and sandy clay with several granitic pebbles and cobbles; poorly sorted; angular; unconsolidated; damp. | | | |
| | 10 | | | 8.0-10.0'-Sample. Recovered 2.0/2.0'=100%. SAND: pale yellowish brown (10YR 6/2) very fine-grained sand and clay; some granitic pebbles; poorly sorted; angular; unconsolidated; damp. | | ▼ | |

| | | |
|----------------|-----------------------|-------------------|
| Remarks | Logged by: J. Bergman | Checked by: _____ |
|----------------|-----------------------|-------------------|

| | | |
|---------------------------------|---------------------------|-------------|
| Project No. 106P06222 | Hydro-Search, Inc. | Page 1 of 2 |
|---------------------------------|---------------------------|-------------|

| | | | | | | | |
|--|--|--|--|--------------------------------------|--|--|--|
| Project: Rocky Flats Plant | | | | LOG OF BORING NO. 12-86 | | | |
| Date Drilled 9/6/86 | | | | Coordinates | | | |
| Boring Method Hollow Stem Auger | | | | Ground Surface Elevation 5788 | | | |

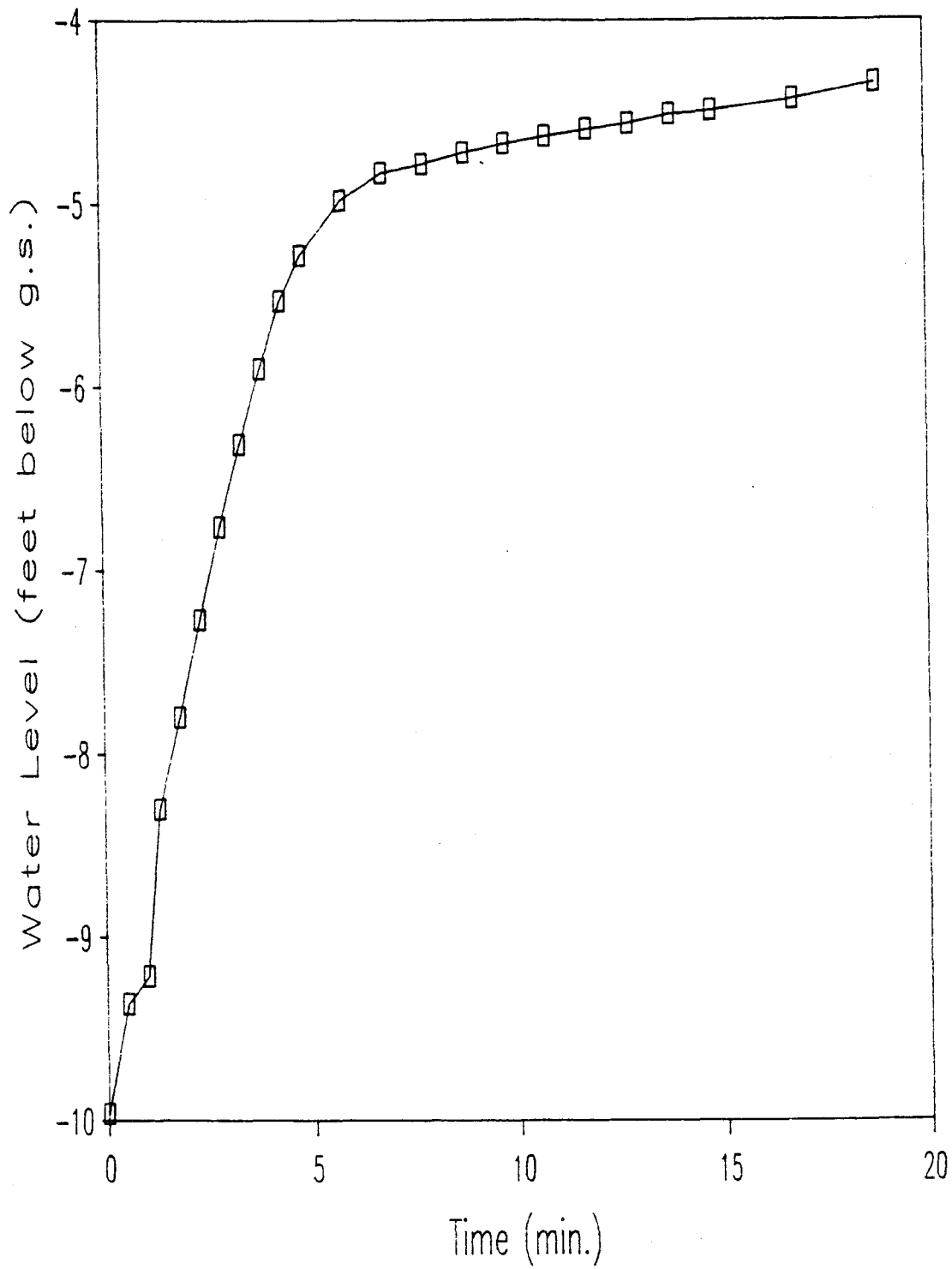
| Elev. (feet) | Depth (feet) | Sample Type | Graphic Log | Material Description | Penetration Resistance (Blows/Inch) 20 40 | Water Content (%) 20 40 | Other Tests |
|-----------------|-----------------|----------------|----------------|--|---|-------------------------------------|----------------|
| | 10 | | | 10.0-11.0'-Sample. Recovered 1.0/1.0'=100%. CLAY: pale yellowish brown (10YR 6/2) clay with trace granitic pebbles poorly sorted; angular to rounded; unconsolidated; damp. | | | |
| | | | | ARAPAHOE FORMATION | | | |
| | 12.5 | | | 11.0-12.0'-Sample. Recovered 1.0/1.0'=100%. CLAYSTONE: pale yellowish brown (10YR 6/2) and light brown (5YR 5/6); consolidated; weathered; dry. | | | |
| | | | | 12.0-14.0'-Sample. Recovered 2.0/2.0'=100%. CLAYSTONE: dark yellowish brown (10YR 4/2) with some moderate brown (5YR 4/4) mottles; consolidated; dry. | | | |
| | 15 | | | 14.0-16.0'-Sample. Recovered 2.0/2.0'=100%. CLAYSTONE: dark yellowish brown (10YR 4/2) and moderate yellowish brown; consolidated; dry. | | | |
| | | | | TOTAL DEPTH: 16.0' | | | |
| | 17.5 | | | | | | |
| | 20 | | | | | | |

| | | |
|----------------|-----------------------|-------------------|
| Remarks | Logged by: J. Bergman | Checked by: _____ |
|----------------|-----------------------|-------------------|

| | | |
|---------------------------------|---------------------------|-------------|
| Project No. 106P06222 | Hydro-Search, Inc. | Page 2 of 2 |
|---------------------------------|---------------------------|-------------|

AQUIFER TEST DATA.

WELL 12-86



AQUIFER TEST DATA

WELL 12-86

Type of Aquifer Test: Bail down - Recovery Project No.: 106P06222
 How Q Measured: 4.5 gallon bucket Location: Rocky Flats Plant
 How W.L.'s Measured: Olympic Well Sounder Personnel: J. Pearce, M. Bergman
 Measuring Point for W.L.'s: Top of Casing
 Elevation of Measuring Point: 5790.49

Depth of pump/airline:

Start bailing: Time: 1115.00

Stop bailing: Time: 1145.10

Duration of Aquifer Test: 49 minutes

| TIME | | WATER LEVEL DATA | | COMMENTS |
|---------------|-----------|---------------------------|-----------|------------------------|
| t = 30.15 min | at t' = 0 | Static Water Level: 4.08' | | |
| t | t' | Water Level | Draw-down | |
| 0 | | | | Begin bailing |
| 30.2 | 0 | 9.96 | 5.89 | Stop bailing |
| 30.7 | .5 | 9.36 | 5.28 | |
| 31.2 | 1.0 | 9.21 | 5.13 | |
| 31.5 | 1.3 | 9.30 | 4.22 | |
| 32.0 | 1.6 | 7.80 | 3.72 | |
| 32.5 | 2.3 | 7.27 | 3.19 | |
| 33.0 | 2.8 | 6.76 | 2.68 | |
| 33.5 | 3.3 | 6.31 | 2.23 | |
| 34.0 | 3.8 | 5.90 | 1.82 | |
| 34.5 | 4.3 | 5.53 | 1.45 | |
| 35.0 | 4.8 | 5.28 | 1.20 | |
| 36.0 | 5.8 | 4.98 | .90 | |
| 37.0 | 6.8 | 4.83 | .75 | |
| 38.0 | 7.8 | 4.78 | .70 | |
| 39.0 | 8.8 | 4.72 | .64 | |
| 40.0 | 9.8 | 4.67 | .59 | 90% Recovered at 4.67' |
| 41.0 | 10.8 | 4.63 | .55 | |
| 42.0 | 11.8 | 4.59 | .51 | |
| 43.0 | 12.8 | 4.56 | .48 | |
| 44.0 | 13.8 | 4.51 | .43 | |
| 45.0 | 14.8 | 4.49 | .41 | |
| 47.0 | 16.8 | 4.43 | .35 | |
| 49.0 | 18.8 | 4.34 | .26 | |

ROCKY FLATS SOLAR PONDS

WATER LEVEL SUMMARY

| WELL NUMBER | DATE | GROUND SURFACE ELEVATION | TOP OF CASING ELEVATION | STICK UP | DEPTH OF SI BASE | WATER DEPTH BELOW TOC | WATER SURFACE ELEVATION |
|----------------|----------|--------------------------------|-------------------------------|-------------|------------------------|-----------------------------|-------------------------------|
| 1286 | 09/08/86 | 5777.88 | 5780.56 | 2.68 | 11.30 | 6.00 | 5774.56 |
| | 09/09/86 | | | | | 5.75 | 5774.81 |
| | 09/25/86 | | | | | 6.17 | 5774.39 |
| | 09/26/86 | | | | | 6.60 | 5773.96 |
| | 10/13/86 | | | | | 4.36 | 5776.20 |
| | 11/26/86 | | | | | 5.60 | 5774.96 |
| | 01/01/87 | | | | | 3.42 | 5777.14 |
| | 02/01/87 | | | | | 2.68 | 5777.88 |
| | 04/01/87 | | | | | 3.35 | 5777.21 |
| | 05/06/87 | | | | | 2.68 | 5777.88 |
| | 06/01/87 | | | | | 2.55 | 5778.01 |
| | 07/08/87 | | | | | 5.00 | 5775.56 |
| | 08/04/87 | | | | | 5.30 | 5775.26 |
| | 09/28/87 | | | | | 4.80 | 5775.76 |
| | 11/03/87 | | | | | 3.90 | 5776.66 |
| | 02/04/88 | | | | | -1.00 | DRY |
| | 03/14/88 | | | | | -1.00 | DRY |
| | 04/11/88 | | | | | 2.70 | 5777.86 |

INDEX OF DATA

Boring No.: 13-86

Completed as well? Yes

Data in File

- ☒ Log of Borehole
- ☒ Well Construction Summaries
- ☐ Well Development Summaries
- ☐ Hydraulic Conductivity Test Data and Results
- ☐ Packer Test Data and Results
- ☒ Water Level Data
- ☒ Saturated Thickness Hydrographs

Project: Rocky Flats Plant

LOG OF BORING NO. 13-86

Date Drilled 8/20/86

Coordinates N 38867.0 E 22951.0

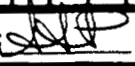
Boring Method Hollow Stem Auger

Ground Surface Elevation 5837.22

| Elev. (feet) | Depth (feet) | Sample Type | Graphic Log | Material Description | Penetration Resistance (Blows/Inch) | | Water Content (%) | | Other Tests |
|-----------------|-----------------|----------------|----------------|---|---|----|-------------------------|----|----------------|
| | | | | | 20 | 40 | 20 | 40 | |
| | 0 | | | VALLEY FILL ALLUVIUM | | | | | |
| | | | | 0.0-2.5'-Sample. Recovered 0.0/2.5'=0%. COBBLES: micaceous granite cobbles and pebbles; poorly sorted; unconsolidated; dry. | | | | | |
| | | | | 2.5-5.0'-Sample. Recovered 0.0/2.5'=0%. CLAY: dark yellowish brown (10YR 4/2); trace of sand and gravel; poorly sorted; unconsolidated; damp. | | | | | |
| | 5 | | | 5.0-8.0'-Sample. Recovered 2.0/3.0=67%. CLAY: dark yellowish brown (10YR 4/2) and dusky brown (5YR 2/2) silty, sandy clay; gray quartzite cobbles from 6.7-7.0'; rounded; damp. | | | | | |
| | | | | 8.0-9.0'-Sample. Recovered 0.5/1.0'50%. GRAVEL: moderate yellowish brown (10YR 5/4) and medium light gray (N6) sandy gravel; some silty clay; poorly sorted; unconsolidated; damp. | | | | | |
| | 10 | | | ARAPAHOE FORMATION | | | | | |
| | | | | 9.0-13.0'-Sample. Recovered 3.5/4.0'=75%. | | | | | |
| | | | | 9.0-10.1'. CLAYSTONE: light olive gray (5Y 6/1); consolidated; dry. | | | | | |
| | | | | 10.1-10.7'. CLAYSTONE: grayish orange (10YR 7/4) sandy claystone; consolidated; dry. | | | | | |
| | 15 | | | 10.7-13.0'. CLAYSTONE: light gray (N 7) silty claystone; consolidated; dry. | | | | | |
| | | | | 13.0-15.5'-Sample. Recovered 2.5/2.5'=100%. CLAYSTONE: moderate yellowish brown (10YR 5/4) silty claystone with traces of limonite concre- tions; blocky texture; consolidated; dry. | | | | | |
| | 20 | | | TOTAL DEPTH: 15.5' | | | | | |

Remarks

Logged by: L. Pivonka

Checked by: Project No.
106P06222

Hydro-Search, Inc.

Page 1 of 1

WELL CONSTRUCTION SUMMARY

 LOCATION or COORDS: _____
 N 38867.0 E 22951.0

 ELEVATION: GROUND LEVEL 5837.22'
 TOP OF CASING 5839.94'

DRILLING SUMMARY:

 TOTAL DEPTH Well: 9.50' Hole: 15.50'
 BOREHOLE DIAMETER 7½"
 DRILLER Boyles Brothers Drilling Co.
 15865 W. 5th Avenue
 Golden, CO (Jim Horn)
 RIG Mobile B-57
 BIT(S) Bull nose bit
 DRILLING FLUID None
 SURFACE CASING 5" x 5' steel w/ locking cap

WELL DESIGN:

 BASIS: GEOLOGIC LOG X GEOPHYSICAL LOG _____
 CASING STRING(S): C=CASING S=SCREEN

| | | | |
|-------|-------|----|--|
| 0.00' | 3.09' | C1 | |
| 3.09' | 9.50' | S1 | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

CASING: C1 2" I.D. Sch. 5 type 316 stainless steel, threaded and flush jointed.

SCREEN: S1 2" I.D. Sch. 5 type 316 stainless steel, threaded and flush jointed. 0.010" wire wrap screen 0.25' welded bottom cap.

CENTRALIZERS Type 304 stainless steel 5.79' - 6.96'

FILTER MATERIAL 16-40 silica sand 2.50' - 10.50'

CEMENT Portland Type I 0.00' - 2.00'

 OTHER 3/8" bentonite pellets 2.00' - 2.50'
 10.50' - 14.50'

CONSTRUCTION TIME LOG:

| TASK | START | | FINISH | |
|-------------------------|--------------|------|--------------|------|
| | DATE 1986 | TIME | DATE 1986 | TIME |
| DRILLING: 7½" auger | 8/20 | 1230 | 8/20 | 1340 |
| | | | | |
| GEOPHYS. LOGGING: | — | — | — | — |
| CASING: 2" stainless | 8/20 | 1607 | 8/20 | 1609 |
| | | | | |
| FILTER PLACEMENT: | 8/20 | 1609 | 8/20 | 1623 |
| CEMENTING: | 8/20 | 1630 | 8/20 | 1641 |
| LEVELCPMENT: | 9/3 | 1035 | 9/3 | 1035 |
| OTHER: Bentonite | 8/20 | 1623 | 8/20 | 1625 |
| | 8/20 | 1605 | 8/20 | 1607 |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

WELL DEVELOPMENT

See Well Development Summary Sheets.

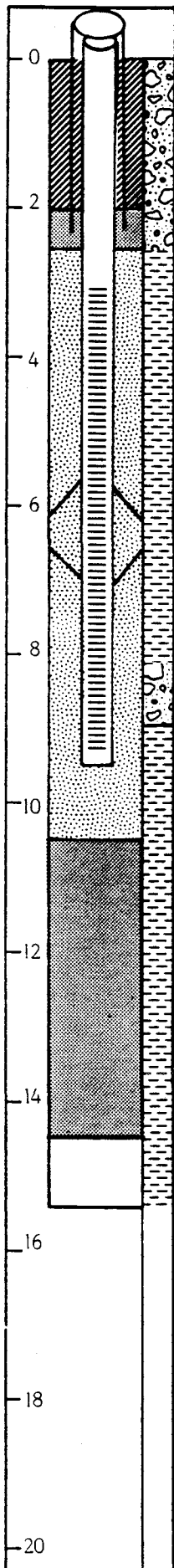
COMMENTS:

Water encountered at 5.0' during drilling.

Top of stainless steel casing: 2.72'

Cave from TD to 14.50'

 LOCATION Golden, CO
 PERSONNEL L. Pivonka

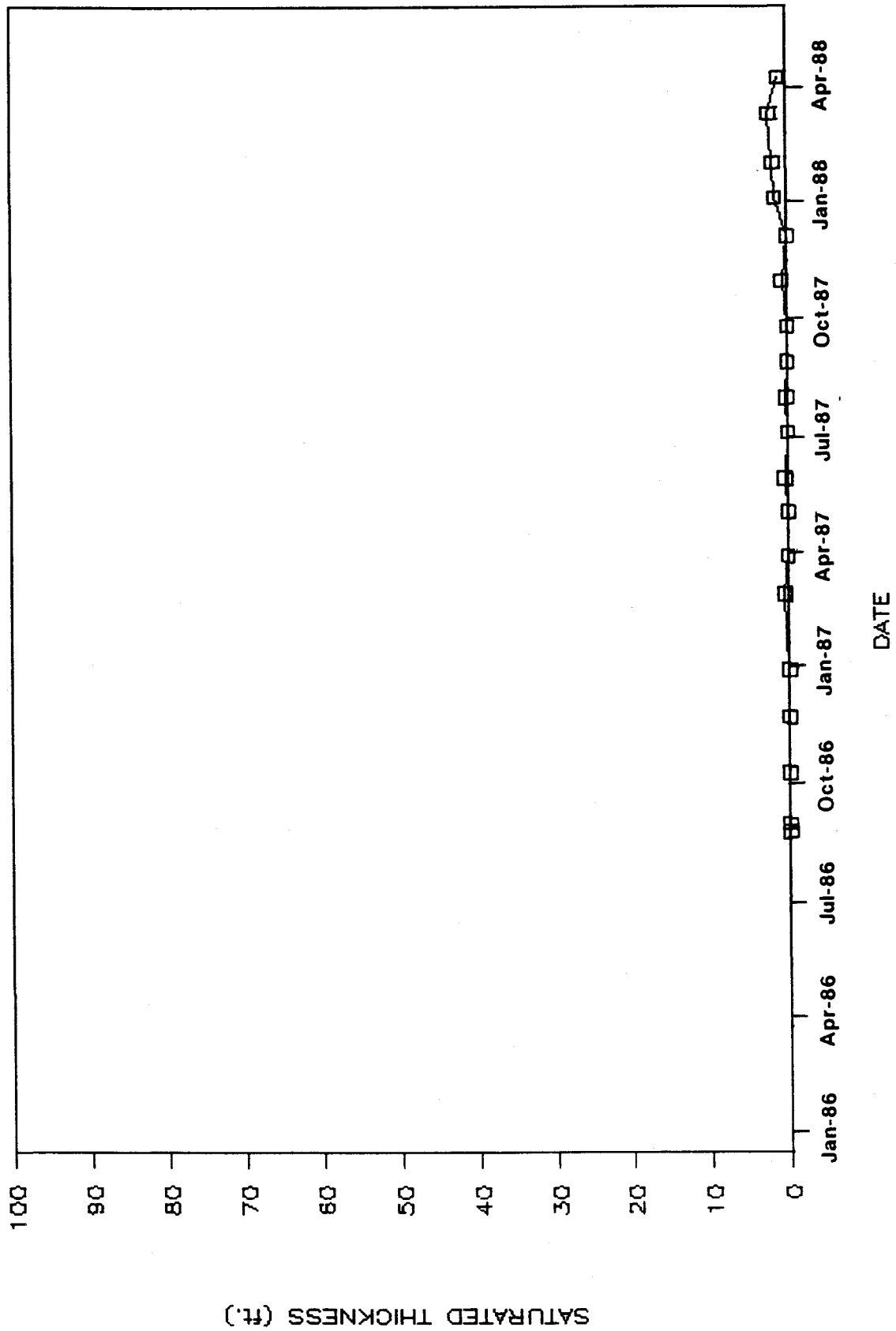
 PROJECT 106P06222
 Rocky Flats Plant


ROCKY FLATS SOLAR PONDS

WATER LEVEL SUMMARY

| WELL NUMBER | DATE | GROUND SURFACE ELEVATION | TOP OF CASING ELEVATION | STICK UP | DEPTH OF SI BASE | WATER DEPTH BELOW TOC | WATER SURFACE ELEVATION |
|----------------|----------|--------------------------------|-------------------------------|-------------|------------------------|-----------------------------|-------------------------------|
| 1386 | 08/27/86 | 5837.22 | 5839.94 | 2.72 | 9.50 | -1.00 | DRY |
| | 09/03/86 | | | | | -1.00 | DRY |
| | 10/13/86 | | | | | -1.00 | DRY |
| | 11/26/86 | | | | | 11.15 | 5828.79 |
| | 01/01/87 | | | | | 9.71 | 5830.23 |
| | 03/02/87 | | | | | 9.00 | 5830.94 |
| | 04/01/87 | | | | | 9.67 | 5830.27 |
| | 05/06/87 | | | | | 9.67 | 5830.27 |
| | 06/01/87 | | | | | 9.04 | 5830.90 |
| | 07/08/87 | | | | | 9.60 | 5830.34 |
| | 08/04/87 | | | | | 9.10 | 5830.84 |
| | 09/01/87 | | | | | 10.00 | 5829.94 |
| | 09/28/87 | | | | | 9.40 | 5830.54 |
| | 11/03/87 | | | | | 8.80 | 5831.14 |
| | 12/08/87 | | | | | 9.70 | 5830.24 |
| | 01/07/88 | | | | | 7.80 | 5832.14 |
| | 02/04/88 | | | | | 7.70 | 5832.24 |
| | 03/14/88 | | | | | 7.20 | 5832.74 |
| | 04/11/88 | | | | | 8.40 | 5831.54 |

SATURATED THICKNESS IN WELL # 13-86 (SP)



INDEX OF DATA

Boring No.: 14-86

Completed as well? Yes

Data in File

- X Log of Borehole
- X Well Construction Summaries
- Well Development Summaries
- X Hydraulic Conductivity Test Data
and Results
- X Packer Test Data and Results
- X Water Level Data
- X Saturated Thickness Hydrographs

Project: Rocky Flats Plant

LOG OF BORING NO.

14-86

Date Drilled 8/19/86; 8/28/86

Coordinates

Boring Method Hollow Stem Auger/NC Core

Ground Surface Elevation 5846

| Elev. (feet) | Depth (feet) | Sample Type | Graphic Log | Material Description | Penetration Resistance (Blows/inch) | | Water Content (%) | | Other Tests |
|-----------------|-----------------|----------------|----------------|---|---|----|-------------------------|----|----------------|
| | | | | | 20 | 40 | 20 | 40 | |
| | 0 | | | VALLEY FILL ALLUVIUM | | | | | |
| | | | | 0-0.9'-Sample. Recovered 0.9/0.9'=100%. CLAY: dark gray (N 3) clay; some granitic gravel; blocky texture; poorly sorted; unconsolidated; dry. | | | | | |
| | 2.5 | | | 0.9-4.7'-Sample. Recovered 3.6/3.8'=95%. CLAY: dark yellowish brown (10YR 4/2) and dusky yellowish brown (10YR 2/2) sandy, gravelly clay with some rounded gray quartzite cobbles; few iron stains; poorly sorted; unconsolidated; dry. | | | | | |
| | 5 | | | 4.7-8.0'-Sample. Recovered 3.3/3.3'=100%. CLAY: grayish brown (5YR 3/2) silty clay; granitic gravel and cobbles from 7.7-8.0'; trace of iron staining mottled through entire interval; dry. | | | | | |
| | 7.5 | | | 8.0-10.5'-Sample. Recovered 2.5/2.5'=100%. CLAY: dark yellowish brown (10YR 4/2) silty clay; some granitic pebbles and cobbles; trace iron staining; damp. | | | | | |
| | 10 | | | | | | | | |

Remarks

Logged by: L. Pivonka & T. Gulliver

Checked by:

Project No.

106P06222

Hydro-Search, Inc.

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Project: Rocky Flats Plant

LOG OF BORING NO.

14-86

Date Drilled 8/19/86; 8/28/86

Coordinates

Boring Method Hollow Stem Auger/NC Core

Ground Surface Elevation 5846

| Elev. (feet) | Depth (feet) | Sample Type | Graphic Log | Material Description | Penetration Resistance | Water Content | | Other Tests |
|-----------------|-----------------|----------------|----------------|--|---------------------------|------------------|--|----------------|
| | | | | | (Blows/inch) | (%) | | |
| | 10 | | | 10.5-11.0'-Sample. Recovered 0.5/0.5'=100%. CLAY: Same as above; damp. | | | | |
| | | | | ARAPAHOE FORMATION | | | | |
| | | | | 11.0-13.0'-Sample. Recovered 2.0/2.0'=100%. CLAYSTONE: moderate yellowish brown (10YR 5/4) with light gray (N 7) mottling; some iron staining and ironstone concretions; weathered; dry. | | | | |
| | 12.5 | | | | | | | |
| | | | | 13.0-18.0'-Sample. Recovered 5.0/5.0'=100%. CLAYSTONE: Same as above; dry. | | | | |
| | 15 | | | | | | | |
| | | | | | | | | |
| | 17.5 | | | | | | | |
| | | | | 18.0-23.0'-Sample. Recovered 2.3/5.0'=46%. CLAYSTONE: Same as above; dry. | | | | |
| | 20 | | | | | | | |

Remarks

Logged by: L. Pivonka & T. Gulliver

Checked by:

Project No.
106P06222

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Project: Rocky Flats Plant

LOG OF BORING NO.

14-86

Date Drilled 8/19/86; 8/28/86

Coordinates

Boring Method Hollow Stem Auger/NC Core

Ground Surface Elevation 5846

| Elev. (feet) | Depth (feet) | Sample Type | Graphic Log | Material Description | Penetration Resistance (Blows/inch) | | Water Content (%) | | Other Tests |
|-----------------|-----------------|----------------|----------------|---|---|----|-------------------------|----|----------------|
| | | | | | 20 | 40 | 20 | 40 | |
| | 20 | | | | | | | | |
| | 22.5 | | | 23.0-23.3'-Sample. Recovered 0.3/0.3'=100%. CLAYSTONE: Same as above; dry. | | | | | |
| | | | | 23.3-25.5'-Sample. Recovered 2.2/2.2'=100%. CLAYSTONE: medium dark gray (N 4) claystone; blocky texture; no mottling; unweathered; dry. | | | | | |
| | 25 | | | 25.5-28.0'-Sample. Recovered 2.0/2.5'=80%. CLAYSTONE: Same as above; dry. | | | | | |
| | | | | 28.0-30.5'-Sample. Recovered 2.1/2.5'=84%. CLAYSTONE: Same as above; dry. | | | | | |
| | 27.5 | | | | | | | | |
| | 30 | | | | | | | | |

Remarks


Logged by: L. Pivonka & T. Gulliver

Checked by: _____

Project No.
106P06222

Hydro-Search, Inc.

Page 3 of 8

| Project: | | Rocky Flats Plant | | LOG OF BORING NO. | | 14-86 | |
|--------------------------|---------------------------|--------------------|--|---|---|--------------------------------|-------------|
| Date Drilled | 8/19/86; 8/28/86 | | Coordinates | | N 38866.4 E 22737.6 | | |
| Boring Method | Hollow Stem Auger/NC Core | | Ground Surface Elevation | | 5844.71 | | |
| Elev. (feet) | Depth (feet) | Sample Type | Graphic Log | Material Description | Penetration Resistance (Blows/inch) 20 40 | Water Content (%) 20 40 | Other Tests |
| | 30 | |  | <p>31.6-32.6'-Sample. Recovered 1.0/1.0'=100%. RQD 0.9/1.0'=90%.</p> <p>CLAYSTONE: dark gray (N 3) massive; damp.</p> <p>32.6-37.0'-Sample. Recovered 4.4/4.4'=100%. RQD 4.4/4.4'=100%.</p> <p>32.6-33.2'. SILTSTONE: medium gray (N 5) massive well sorted; damp.</p> <p>33.2-34.5'. CLAYSTONE: medium dark gray (N 4); damp.</p> <p>34.5-35.3'. SILTSTONE: medium gray (N 5); clayey; grading downward into silty claystone; damp.</p> <p>35.3-37.0'. CLAYSTONE: dark gray (N 3); silty; damp.</p> <p>37.0-42.3'-Sample. Recovered 4.1/5.3=77%. RQD 3.4/4.1'=83%.</p> <p>37.0-37.6'. CLAYSTONE: dark gray (N 3); damp.</p> <p>38.9-39.7'. CLAYSTONE: dark gray (N 3); damp.</p> | | | |
| | 32.5 | | | | | | |
| | 35 | | | | | | |
| | 37.5 | | | | | | |
| | 40 | | | | | | |
| Remarks | | | | Logged by: L. Pivonka & T. Gulliver | | Checked by: <i>[Signature]</i> | |
| Project No. 106P06222 | | Hydro-Search, Inc. | | | Page 4 of 8 | | |

| | | | | | | | | | |
|--|--|--|--|----------------------------------|--|--|--|-------|--|
| Project: Rocky Flats Plant | | | | LOG OF BORING NO. | | | | 14-86 | |
| Date Drilled: 8/19/86; 8/28/86 | | | | Coordinates N 38866.4 E 22737.6 | | | | | |
| Boring Method: Hollow Stem Auger/NC Core | | | | Ground Surface Elevation 5844.71 | | | | | |

| Elev. (feet) | Depth (feet) | Sample Type | Graphic Log | Material Description | Penetration Resistance (Blows/Inch) 20 40 | Water Content (%) 20 40 | Other Tests |
|-----------------|-----------------|----------------|----------------|---|---|-------------------------------------|----------------|
| | 40 | | | <p>41.6-42.3'. CLAYSTONE: black (N 1); carbonaceous; damp.</p> <p>42.3-46.5'-Sample. Recovered 4.2/4.2'=100%. RQD 3.4/4.2'=81%.</p> <p>42.3-44.2'. SANDSTONE: light gray (N 7); very fine-grained; moderately sorted; rounded; massive; damp.</p> <p>44.2-44.4'. CLAYSTONE: greenish gray (5G 6/1); damp.</p> <p>44.4-46.5'. SANDSTONE: light gray (N 7); very fine-grained; moderately sorted; rounded; massive; damp.</p> <p>46.5-51.5'-Sample. Recovered 5.0/5.0'=100%. RQD 3.6/5.0'=72%.</p> <p>46.5-50.6'. SANDSTONE: light gray (N 7); very fine-grained; silty; carbonaceous siltstone laminae; coal coated joints with 40-50 degree dip from 47.5-48.0'; moderately sorted; damp.</p> | | | |
| | 42.5 | | | | | | |
| | 45 | | | | | | |
| | 47.5 | | | | | | |
| | 50 | | | | | | |

| | | |
|---------|-------------------------------------|-------------|
| Remarks | Logged by: L. Pivonka & T. Gulliver | Checked by: |
|---------|-------------------------------------|-------------|

| | | |
|--------------------------|---------------------------|-------------|
| Project No. 106P06222 | Hydro-Search, Inc. | Page 5 of 8 |
|--------------------------|---------------------------|-------------|

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|--|--|--|--|---|--|--|--|
| Project: Rocky Flats Plant | | | | LOG OF BORING NO. 14-86 | | | |
| Date Drilled 8/19/86; 8/28/86 | | | | Coordinates N 38866.4 E 22737.6 | | | |
| Boring Method Hollow Stem Auger/NC Core | | | | Ground Surface Elevation 5844.71 | | | |

| Elev. (feet) | Depth (feet) | Sample Type | Graphic Log | Material Description | Penetration Resistance (Blows/Inch) | | Water Content (%) | | Other Tests |
|-----------------|-----------------|----------------|----------------|--|---|----|-------------------------|----|----------------|
| | | | | | 20 | 40 | 20 | 40 | |
| | 50 | | | 50.6-51.5'. SANDSTONE: light gray (N 7); very fine-grained; silty; abundant coal partings; moderately sorted; damp. 51.5-52.8'-Sample. Recovered 1.3/1.3'=100%. RQD 1.3/1.3'=100%. 51.5-52.2'. SANDSTONE: light gray (N 7); very fine-grained; silty; some coal partings; moderately sorted; damp. 52.2-52.4'. SANDSTONE: light gray (N 7); fine- grained; abundant carbonaceous detritus; moderately sorted; damp. 52.4-52.8'. SANDSTONE: light gray (N 7); fine- grained; laminated; moderately sorted; subrounded; damp. 52.8-56.3'-Sample. Recovered 2.9/4.5'=62%. RQD 1.8/2.9'=62%. 52.8-53.3'. SILTSTONE: dark gray (N 3); clayey; evenly laminated; damp. 53.3-54.0'. CLAYSTONE: grayish black (N 2); 0.10' thick sandstone beds from 53.7-54.0'; damp. 54.0-55.0'. Lost core. 55.0-56.3'. CLAYSTONE: grayish black (N 2); silty; laminated; 15 degree dip; damp. 56.3-60.9'-Sample. Recovered 2.8/4.5'=62%. RQD 1.8/4.5'=40%. 56.3-57.8'. CLAYSTONE: dark gray (N 3); silty; laminated; damp. 57.8-59.5'. Lost core. | | | | | |
| | 52.5 | | | | | | | | |
| | 55 | | | | | | | | |
| | 57.5 | | | | | | | | |
| | 60 | | | | | | | | |

| | | |
|----------------|-------------------------------------|--------------------------------|
| Remarks | Logged by: L. Pivonka & T. Gulliver | Checked by: <i>[Signature]</i> |
|----------------|-------------------------------------|--------------------------------|

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|---------------------------------|---------------------------|-------------|
| Project No. 106P06222 | Hydro-Search, Inc. | Page 6 of 8 |
|---------------------------------|---------------------------|-------------|

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|---|--|--|--|----------------------------------|--|--|--|-------|--|
| Project: Rocky Flats Plant | | | | LOG OF BORING NO. | | | | 14-86 | |
| Date Drilled 8/19/86; 8/28/86 | | | | Coordinates N 38866.4 E 22737.6 | | | | | |
| Boring Method Hollow Stem Auger/NC Core | | | | Ground Surface Elevation 5844.71 | | | | | |

| Elev. (feet) | Depth (feet) | Sample Type | Graphic Log | Material Description | Penetration Resistance (Blows/Inch) | Water Content (%) | Other Tests |
|-----------------|-----------------|----------------|----------------|---|---|-------------------------|----------------|
| | | | | | 20 40 | 20 40 | |
| | 60 | | | 59.5-60.9'. SILTSTONE: dark gray (N 3); clayey; laminated; 10 degree dip; damp. | | | |
| | | | | 60.9-65.9'-Sample. Recovered 5.0/5.0'=100%. RQD 1.0/5.0'=20%. | | | |
| | | | | 60.9-63.2'. SILTSTONE: dark gray (N 3); clayey; laminated; 10 degree dip; damp. | | | |
| | 62.5 | | | 63.2-64.5'. Lost core. | | | |
| | | | | 64.5-65.9'. SILTSTONE: grayish black (N 2) to light gray (N 7); clayey; very fine-grained; laminated; damp. | | | |
| | | | | 65.9-70.9'-Sample. Recovered 5.0/5.0'=100%. RQD 3.6/5.0'=72%. | | | |
| | 65 | | | SILTSTONE: grayish black (N 2) to light gray (N 7); clayey; very fine-grained; laminated; damp. | | | |
| | | | | | | | |
| | 67.5 | | | | | | |
| | 70 | | | | | | |

| | | |
|---------|-------------------------------------|--------------------------------|
| Remarks | Logged by: L. Pivonka & T. Gulliver | Checked by: <i>[Signature]</i> |
|---------|-------------------------------------|--------------------------------|

| | | |
|--------------------------|---------------------------|-------------|
| Project No. 106P06222 | Hydro-Search, Inc. | Page 7 of 8 |
|--------------------------|---------------------------|-------------|

Project: Rocky Flats Plant

LOG OF BORING NO.

14-86

Date Drilled 8/19/86; 8/28/86

Coordinates N 38866.4 E 22737.6

Boring Method Hollow Stem Auger/NC Core

Ground Surface Elevation 5844.71

| Elev. (feet) | Depth (feet) | Sample Type | Graphic Log | Material Description | Penetration Resistance (Blows/Inch) | | Water Content (%) | | Other Tests |
|-----------------|-----------------|----------------|----------------|--|---|----|-------------------------|----|----------------|
| | | | | | 20 | 40 | 20 | 40 | |
| | 70 | | | 70.9-74.5'-Sample. Recovered 3.6/3.6'=100%. RQD 2.6/3.6'=72%. 70.9-71.6'. SILTSTONE: Same as above; damp. 71.6-74.0'. CLAYSTONE: grayish black (N 2); silty; laminated; damp. 74.0-74.5'. Lost core. | | | | | |
| | 72.5 | | | | | | | | |
| | 75 | | | TOTAL DEPTH: 74.5' | | | | | |
| | 77.5 | | | | | | | | |
| | 80 | | | | | | | | |

Remarks

Logged by: L. Pivonka & T. Gulliver

Checked by: Project No.
106P06222

Hydro-Search, Inc.

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WELL CONSTRUCTION SUMMARY

 LOCATION or COORDS: _____
 N 38866.4' E 22737.6

 ELEVATION: GROUND LEVEL 5844.71'
 TOP OF CASING 5846.73'

DRILLING SUMMARY:

 TOTAL DEPTH Well: 55.36' Hole: 74.00'
 BOREHOLE DIAMETER 0.00' - 30.50': 7 1/2"
 30.50' - 74.00': 4 3/4"
 DRILLER Boyles Brothers Drilling Co.
 15865 W. 5th Avenue, Golden, CO
 (Jim Horn, Paul Wiebe)
 0.00' - 30.50': Mobile B-57; 30.50' -
 74.00': Ealing 1500
 BIT(S) 0.00' - 30.50': Blade bit; 30.00' -
 74.00': Chrisprill 3 3/4" Tricone 4 3/4"
 reamer
 DRILLING FLUID 0.00' - 30.50': None
 30.50' - 74.00': air/water mist
 SURFACE CASING 5" x 33.16 steel w/ locking
 cap

WELL DESIGN:

 BASIS: GEOLOGIC LOG ☒ GEOPHYSICAL LOG _____
 CASING STRING(S): C=CASING S=SCREEN

| | | | | | |
|--------|--------|----|---|---|---|
| 0.00' | 30.50' | C1 | - | - | - |
| 0.00' | 39.42' | C2 | - | - | - |
| 39.42' | 55.36' | S1 | - | - | - |
| - | - | - | - | - | - |
| - | - | - | - | - | - |
| - | - | - | - | - | - |
| - | - | - | - | - | - |
| - | - | - | - | - | - |
| - | - | - | - | - | - |
| - | - | - | - | - | - |

 CASING: C1 5" I.D. steel surface casing.
 C2 2" I.D. Sch. 5, type 316 stain-
 less steel, threaded and flush
 jointed.
 SCREEN: S1 2" I.D. Sch. 5 type 316 stain-
 less steel, threaded and flush
 jointed, 0.010" wire wrap screen,
 0.25' welded bottom cap.
 CENTRALIZERS Type 304 stainless steel
 46.79' - 48.02'
 FILTER MATERIAL 32-42 silica sand: 38.15' -
 55.36'; 16-20 silica sand: 55.36' - 56.85'
 CEMENT Portland Type I
 0.00' - 35.40'
 OTHER 3/8" bentonite pellets
 35.40' - 38.15'
 56.85' - 69.00'

CONSTRUCTION TIME LOG:

| TASK | START | | FINISH | |
|--------------------|-------|------|--------|------|
| | DATE | TIME | DATE | TIME |
| DRILLING: | 1986 | | 1986 | |
| 7 1/2" auger | 8/19 | 1300 | 8/19 | 1610 |
| NC core | 8/29 | 0838 | 8/29 | 1343 |
| Reaming | 9/3 | 0900 | 9/3 | 0917 |
| GEOPHYS. LOGGING: | - | - | - | - |
| CASING: | | | | |
| 5" steel | 8/19 | 1625 | 8/20 | 1008 |
| 2" stainless | 9/3 | 1100 | 9/3 | 1105 |
| FILTER PLACEMENT: | 9/3 | 1105 | 9/3 | 1200 |
| CEMENTING: | 9/3 | 1200 | 9/3 | 1230 |
| DEVELOPMENT: | 9/5 | 1130 | 9/17 | 1100 |
| OTHER: | | | | |
| Bentonite | 9/3 | 1200 | 9/3 | 1202 |
| | 9/3 | 0925 | 9/3 | 1020 |
| Packer testing | 9/2 | 1100 | 9/2 | 1700 |
| Cementing 5" steel | 8/20 | 1008 | 8/20 | 1030 |

WELL DEVELOPMENT

See Well Development Summary Sheet.

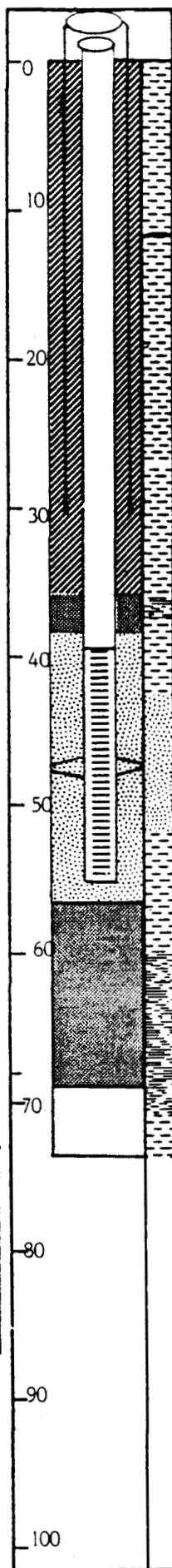
COMMENTS:

No water encountered during drilling.

Top of stainless steel casing: 2.02'

Cave from TD to 69.00'.

 LOCATION Golden, CO
 PERSONNEL L. Pivonka/T. Gulliver

 PROJECT 106P06222
 Rocky Flats Plant


CLIENT/SUBJECT _____ W.O. NO. _____

TASK DESCRIPTION _____ TASK NO. _____

| | | | |
|--------------------------|------------|---------------------|-----------------------|
| PREPARED BY _____ | DEPT _____ | DATE _____ | APPROVED BY _____ |
| MATH CHECK BY <u>MP</u> | DEPT _____ | DATE <u>6/21/88</u> | |
| METHOD REV. BY <u>MP</u> | DEPT _____ | DATE <u>6/21/88</u> | DEPT _____ DATE _____ |

WELL 14-86

Hydraulic Conductivity (cm/sec) = 1.9×10^{-7}

Flowrate (gpm) = 0.277 gpm

Screened Interval (ft below G.L.) = 39.42 - 55.36'

39.42 - 42.3 claystone

42.3 - 44.2 sandstone

44.2 - 44.4 claystone

44.4 - 52.8 sandstone

52.8 - 53.3 siltstone

53.3 - 55.36 claystone

(54.0 - 55.0 lost core)

Method of Analysis: residual-drawdown Plot

(Driscoll, 1986 - pg 256.)

CLIENT/SUBJECT _____ W.O. NO. _____

TASK DESCRIPTION _____ TASK NO. _____

| | | | |
|----------------------|------------|------------|-----------------------|
| PREPARED BY _____ | DEPT _____ | DATE _____ | APPROVED BY _____ |
| MATH CHECK BY _____ | DEPT _____ | DATE _____ | |
| METHOD REV. BY _____ | DEPT _____ | DATE _____ | DEPT _____ DATE _____ |

WELL 14-86

$$T \text{ (gpd/ft)} = \frac{264 Q}{\Delta S'} = \frac{(264)(0.277)}{1121} = 6.52 \times 10^{-2}$$

where $Q \text{ (gpm)} = 7.75 \text{ gal/28 min} = 0.277 \text{ gpm}$

$\Delta S' = \Delta t$, change in residual drawdown / log cycle
 $= 1121 \text{ ft}$ (see attached plot)

$$K \text{ (gpd/ft}^2\text{)} = T/b = 6.52 \times 10^{-2} / 15.94 = 4.09 \times 10^{-3}$$

where $b \text{ (ft)} = 15.94$

$$K \text{ (cm/sec)} = 4.09 \times 10^{-3} \text{ gpd/ft}^2 \times \frac{4.72 \times 10^{-5} \text{ cm/sec}}{\text{gpd/ft}^2} = 1.9 \times 10^{-7}$$

This method is valid where $u \leq 0.01$

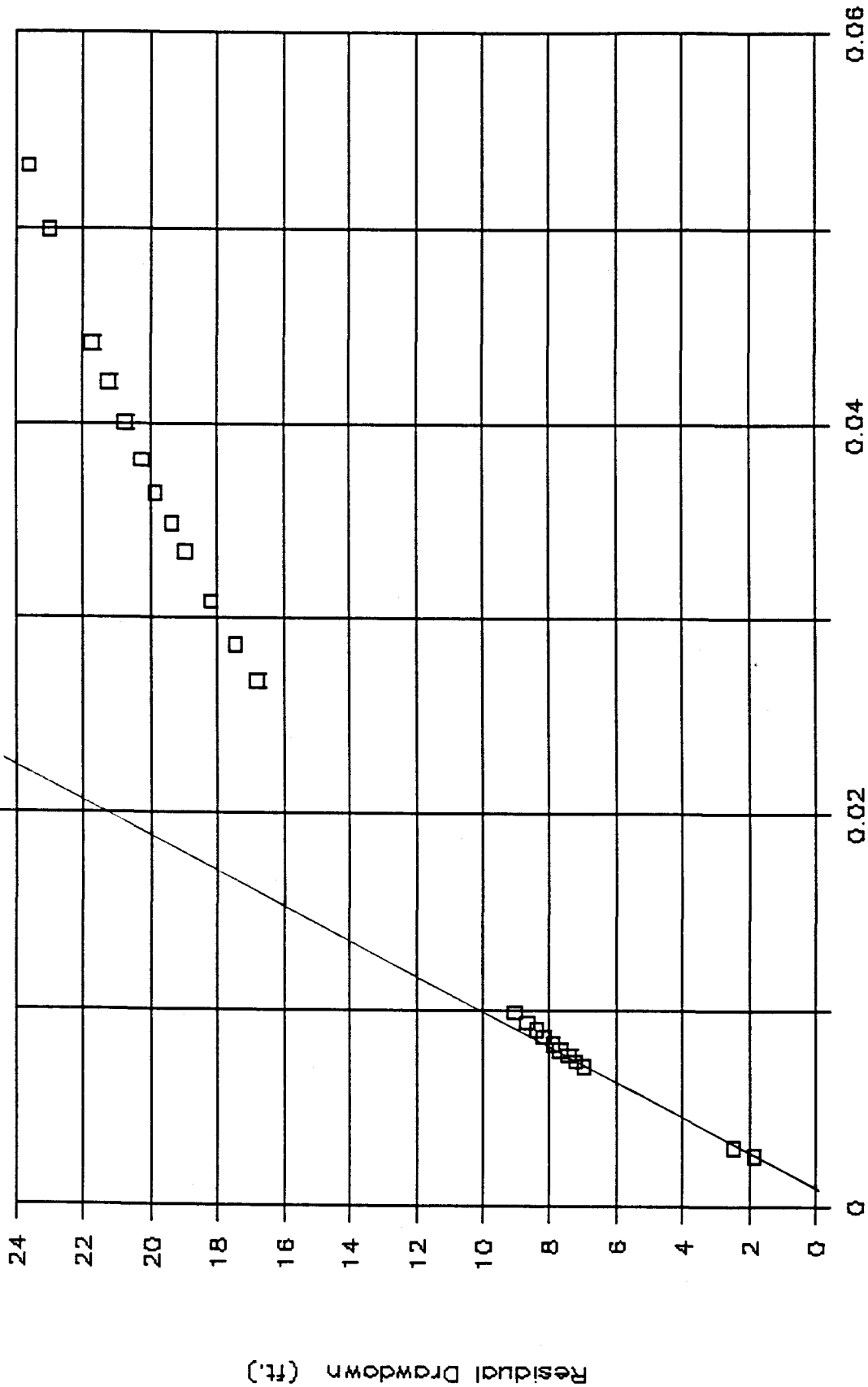
solving for t for $u \leq 0.01$

$$t \text{ (min)} = \frac{r^2 S}{4 T u} = \frac{(1.2)^2 (10^{-3})}{(4)(6.52 \times 10^{-2})(0.01)} \times \frac{1440 \text{ min}}{\text{day}} \times \frac{7.482 \text{ gal}}{\text{ft}^3} = 165 \text{ min}$$

where $r \text{ (ft)} = \left(\frac{4.75}{24} \right) \text{ ft} = .20 \text{ ft}$

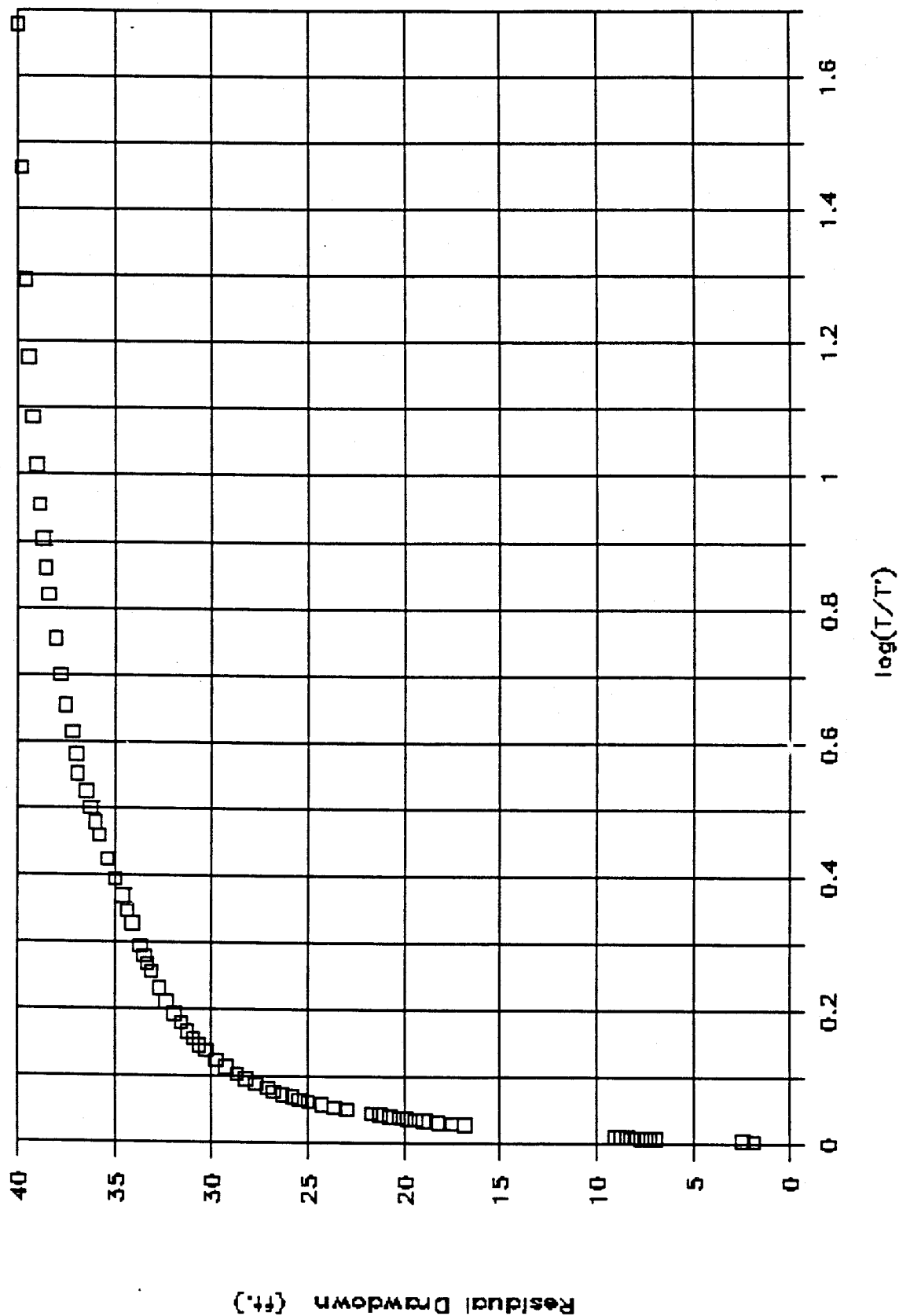
$S = 10^{-3}$ assumed S for confined aquifer
 $\Delta S'$ is based on points where $t \geq 1520 \text{ min}$

WELL 14-86

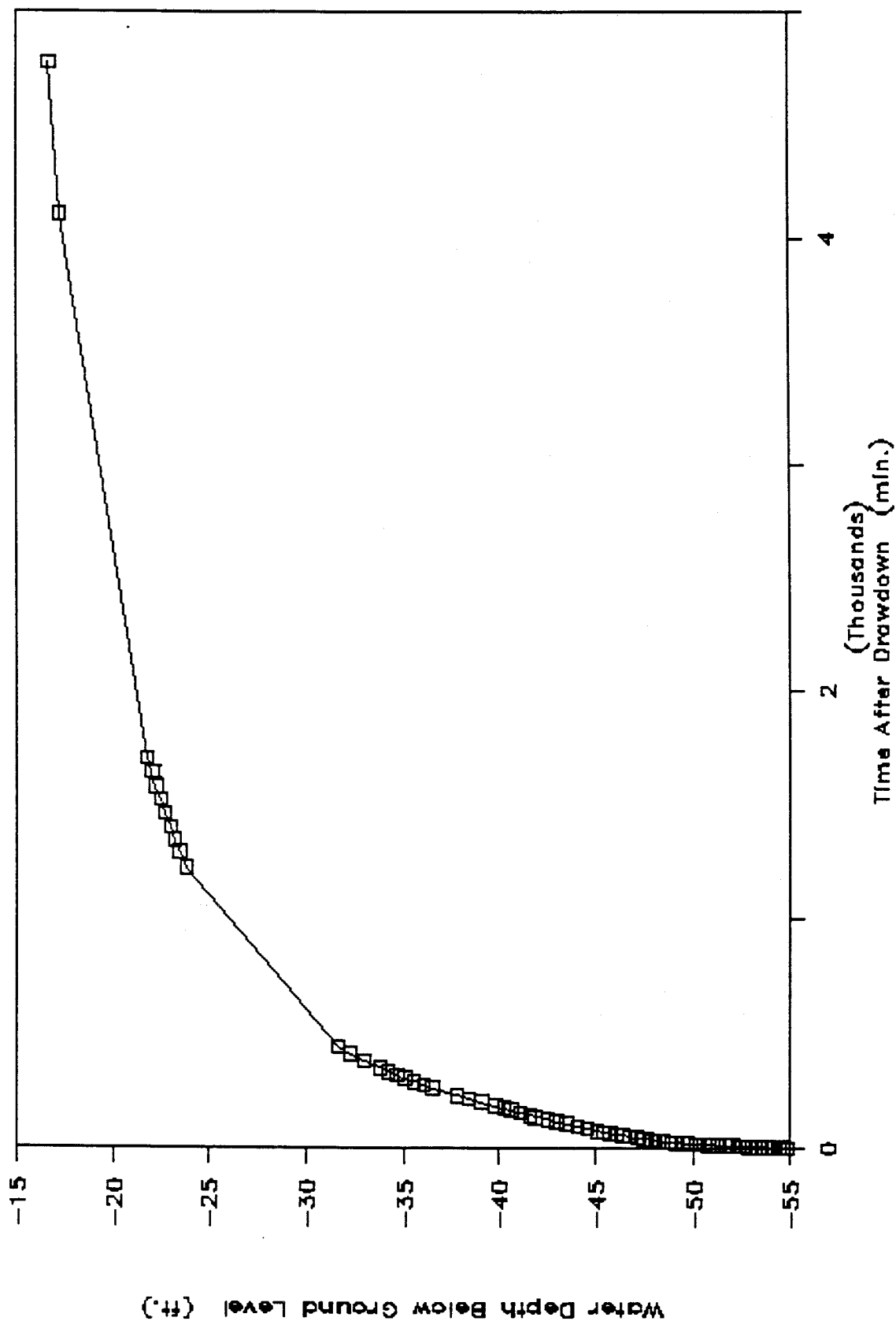


$$\log(T/T') \quad \Delta S' = \frac{(24 - 0) \text{ ft}}{0.0224 - 0.0010} = 1121 \text{ ft} / \log \gamma_{ck}.$$

WELL 14-86



WELL 14-86



WELL 14-86

| T Time (min.) | T' T Prime (min.) | Water Level (ft.) | s' Rsd Drwn (ft.) | log(T/T') |
|---------------------|-------------------------|-------------------------|-------------------------|-----------|
| 28.60 | 0.60 | 54.79 | 39.99 | 1.68 |
| 29.00 | 1.00 | 54.59 | 39.79 | 1.46 |
| 29.50 | 1.50 | 54.40 | 39.60 | 1.29 |
| 30.00 | 2.00 | 54.22 | 39.42 | 1.18 |
| 30.50 | 2.50 | 54.03 | 39.23 | 1.09 |
| 31.00 | 3.00 | 53.84 | 39.04 | 1.01 |
| 31.50 | 3.50 | 53.67 | 38.87 | 0.95 |
| 32.00 | 4.00 | 53.51 | 38.71 | 0.90 |
| 32.50 | 4.50 | 53.37 | 38.57 | 0.86 |
| 33.00 | 5.00 | 53.23 | 38.43 | 0.82 |
| 34.00 | 6.00 | 52.86 | 38.06 | 0.75 |
| 35.00 | 7.00 | 52.58 | 37.78 | 0.70 |
| 36.00 | 8.00 | 52.32 | 37.52 | 0.65 |
| 37.00 | 9.00 | 52.00 | 37.20 | 0.61 |
| 38.00 | 10.00 | 51.74 | 36.94 | 0.58 |
| 39.00 | 11.00 | 51.71 | 36.91 | 0.55 |
| 40.00 | 12.00 | 51.27 | 36.47 | 0.52 |
| 41.00 | 13.00 | 51.02 | 36.22 | 0.50 |
| 42.00 | 14.00 | 50.80 | 36.00 | 0.48 |
| 43.00 | 15.00 | 50.58 | 35.78 | 0.46 |
| 45.00 | 17.00 | 50.16 | 35.36 | 0.42 |
| 47.00 | 19.00 | 49.74 | 34.94 | 0.39 |
| 49.00 | 21.00 | 49.44 | 34.64 | 0.37 |
| 51.00 | 23.00 | 49.16 | 34.36 | 0.35 |
| 53.00 | 25.00 | 48.91 | 34.11 | 0.33 |
| 57.00 | 29.00 | 48.48 | 33.68 | 0.29 |
| 59.00 | 31.00 | 48.29 | 33.49 | 0.28 |
| 61.00 | 33.00 | 48.11 | 33.31 | 0.27 |
| 63.00 | 35.00 | 47.93 | 33.13 | 0.26 |
| 68.00 | 40.00 | 47.52 | 32.72 | 0.23 |
| 73.00 | 45.00 | 47.13 | 32.33 | 0.21 |
| 78.00 | 50.00 | 46.75 | 31.95 | 0.19 |
| 83.00 | 55.00 | 46.40 | 31.60 | 0.18 |
| 88.00 | 60.00 | 46.05 | 31.25 | 0.17 |
| 93.00 | 65.00 | 45.75 | 30.95 | 0.16 |
| 98.00 | 70.00 | 45.44 | 30.64 | 0.15 |
| 103.00 | 75.00 | 45.11 | 30.31 | 0.14 |
| 113.00 | 85.00 | 44.57 | 29.77 | 0.12 |
| 123.00 | 95.00 | 44.05 | 29.25 | 0.11 |
| 133.00 | 105.00 | 43.51 | 28.71 | 0.10 |
| 143.00 | 115.00 | 43.03 | 28.23 | 0.09 |
| 153.00 | 125.00 | 42.53 | 27.73 | 0.09 |

WELL 14-86

| T Time (min.) | T' T Prime (min.) | Water Level (ft.) | s' Rsd Drwn (ft.) | log(T/T') |
|---------------------|-------------------------|-------------------------|-------------------------|-----------|
| 163.00 | 135.00 | 41.88 | 27.08 | 0.08 |
| 173.00 | 145.00 | 41.60 | 26.80 | 0.08 |
| 183.00 | 155.00 | 41.12 | 26.32 | 0.07 |
| 194.00 | 166.00 | 40.63 | 25.83 | 0.07 |
| 203.00 | 175.00 | 40.28 | 25.48 | 0.06 |
| 213.00 | 185.00 | 39.79 | 24.99 | 0.06 |
| 228.00 | 200.00 | 39.06 | 24.26 | 0.06 |
| 243.00 | 215.00 | 38.43 | 23.63 | 0.05 |
| 258.00 | 230.00 | 37.82 | 23.02 | 0.05 |
| 290.00 | 262.00 | 36.53 | 21.73 | 0.04 |
| 303.00 | 275.00 | 36.06 | 21.26 | 0.04 |
| 318.00 | 290.00 | 35.55 | 20.75 | 0.04 |
| 333.00 | 305.00 | 35.07 | 20.27 | 0.04 |
| 348.00 | 320.00 | 34.67 | 19.87 | 0.04 |
| 363.00 | 335.00 | 34.19 | 19.39 | 0.03 |
| 378.00 | 350.00 | 33.79 | 18.99 | 0.03 |
| 408.00 | 380.00 | 33.01 | 18.21 | 0.03 |
| 438.00 | 410.00 | 32.28 | 17.48 | 0.03 |
| 468.00 | 440.00 | 31.63 | 16.83 | 0.03 |
| 1248.00 | 1220.00 | 23.86 | 9.06 | 0.01 |
| 1318.00 | 1290.00 | 23.49 | 8.69 | 0.01 |
| 1368.00 | 1340.00 | 23.22 | 8.42 | 0.01 |
| 1428.00 | 1400.00 | 23.00 | 8.20 | 0.01 |
| 1488.00 | 1460.00 | 22.70 | 7.90 | 0.01 |
| 1548.00 | 1520.00 | 22.48 | 7.68 | 0.01 |
| 1603.00 | 1575.00 | 22.24 | 7.44 | 0.01 |
| 1668.00 | 1640.00 | 22.03 | 7.23 | 0.01 |
| 1728.00 | 1700.00 | 21.78 | 6.98 | 0.01 |
| 4133.00 | 4105.00 | 17.28 | 2.48 | 0.00 |
| 4803.00 | 4775.00 | 16.68 | 1.88 | 0.00 |

AQUIFER TEST DATA

WELL 14-26
PUMPING or OBSERVATION WELL
PUMPING or RECOVERY DATA
PAGE 1 OF 2

TYPE OF AQUIFER TEST Pail down - Recovery
HOW Q MEASURED 4 1/2 gal bucket
HOW W.L.'s MEASURED OLVIMATIC WELL SOUNDING
RAD./DIST. OF/FROM PUMPING WELL 0
MEAS. POINT FOR W.L.'s N. side of water casing
ELEVATION OF MEAS. POINT _____

DEPTH OF PUMP/AIRPIPE _____
PUMP ON: date 9/26/86 time _____
PUMP OFF: date _____ time _____
DURATION OF AQUIFER TEST _____

| TIME | | | | WATER LEVEL DATA | | | | DISCHARGE | RECORDED BY | COMMENTS |
|-------------------------|------------|----------|-----|---------------------------------|----------------------------|-------------|---------|-----------|-------------|------------------|
| t = <u>22</u> at t' = 0 | | | | STATIC WATER LEVEL <u>14.80</u> | | | | | | |
| DAY | CLOCK TIME | t | t' | READING | CONVERSIONS OF CORRECTIONS | WATER LEVEL | s or s' | READING | Q | |
| 1 | 11:05 | original | 1 | 15+1.85 | 2.05 | 14.80 | N/A | | | WH |
| | 11:07 | 0 | | 15+1.85 | 2.05 | 14.80 | 0 | | | " |
| | 11:11 | 4 | | | | | | | 2 gal | |
| | 11:14 | 7 | | | | | | | 1 gal | |
| | 11:16 | 9 | | | | | | | 1 gal | |
| | 11:18 | 11 | | | | | | | 1 gal | |
| | 11:23 | 16 | | | | | | | 2 gal | |
| | 11:29 | 22 | | | | | | | 6.75 gal | |
| | 11:35 | 28 | 0 | | | | | | | |
| | 11:35:35 | 22.6 | 2.2 | 55+1.84 | 2.05 | 54.79 | -2.99 | | | 70% Recovery = 6 |
| | 11:36:00 | 22 | | 55+1.64 | | 54.59 | -3.19 | | | |
| | 11:36:30 | 24.5 | 1.5 | 55+1.45 | | 54.40 | -3.40 | | | |
| | 11:37:00 | 27 | 2 | 55+1.27 | | 54.22 | -3.42 | | | |
| | 11:37:30 | 30.5 | 2.5 | 55+1.08 | | 54.03 | -3.43 | | | |
| | 11:38:00 | 31 | 3 | 55+0.89 | | 53.84 | -3.44 | | | |
| | 11:38:30 | 31.5 | 3.5 | 55+0.72 | | 53.67 | -3.47 | | | |
| | 11:39:00 | 32 | 4 | 55+0.56 | | 53.51 | -3.47 | | | |
| | 11:39:30 | 32.5 | 4.5 | 55+0.42 | | 53.37 | -3.47 | | | |
| | 11:40:00 | 33 | 5 | 55+0.28 | | 53.23 | -3.43 | | | DP |
| | 11:41 | 34 | 6 | 50+1.91 | | 52.86 | -3.46 | | | DP |
| | 11:42 | 35 | 7 | 50+1.63 | | 52.58 | -3.47 | | | DP |
| | 11:43 | 36 | 8 | 50+1.37 | | 52.32 | -3.52 | | | WH |
| | 11:44 | 37 | 9 | 50+1.09 | | 52.00 | -3.70 | | | WH |
| | 11:45 | 38 | 10 | 50+0.79 | | 51.74 | -3.64 | | | WH |
| | 11:46 | 39 | 11 | 50+0.56 | | 51.71 | -3.62 | | | WH |
| | 11:47 | 40 | 12 | 50+0.33 | | 51.27 | -3.64 | | | WH |
| | 11:48 | 41 | 13 | 50+0.07 | | 51.02 | -3.62 | | | WH |
| | 11:49 | 42 | 14 | 50+2.85 | | 50.80 | -3.60 | | | WH |
| | 11:50 | 43 | 15 | 50+2.63 | | 50.58 | -3.58 | | | DP |
| | 11:52 | 45 | 17 | 50+2.21 | | 50.16 | -3.53 | | | DP |
| | 11:54 | 47 | 19 | 50+1.79 | | 49.74 | -3.49 | | | WH |
| | 11:56 | 49 | 21 | 50+1.49 | | 49.44 | -3.46 | | | WH |
| | 11:58 | 51 | 23 | 50+1.21 | | 49.16 | -3.43 | | | WH |
| | 12:00 | 53 | 25 | 50+0.94 | | 48.91 | -3.41 | | | DP |
| | 12:02 | 55 | 27 | 50+0.74 | | 48.69 | -3.29 | | | DP |
| | 12:04 | 57 | 29 | 50+0.53 | | 48.48 | -3.42 | | | WH |
| | 12:06 | 59 | 31 | 50+0.34 | | 48.29 | -3.49 | | | WH |
| | 12:08 | 61 | 33 | 50+0.16 | | 48.11 | -3.31 | | | WH |
| | 12:10 | 63 | 35 | 45+1.98 | | 47.93 | -3.13 | | | DP |
| | 12:15 | 68 | 40 | 45+1.57 | | 47.52 | -3.72 | | | WH |
| | 12:20 | 73 | 45 | 45+1.10 | | 47.13 | -3.23 | | | DP |

AQUIFER TEST DATA

WELL 1486
PUMPING or OBSERVATION WELL
PUMPING or RECOVERY DATA
PAGE 2 OF 2

TYPE OF AQUIFER TEST Fail down - Recovery
HOW Q MEASURED 45 gallon bucket
HOW W.L.'s MEASURED OLYMPIC well sounder
RAD./DIST. OF/FROM PUMPING WELL 0
MEAS. POINT FOR W.L.'s W. side of inner casing
ELEVATION OF MEAS. POINT _____

DEPTH OF PUMP/AIRPIPE _____
PUMP ON: date _____ time _____
PUMP OFF: date _____ time _____
DURATION OF AQUIFER TEST _____

LOCATION Elise "Blue" Zone
PERSONNEL W. Herst D. Pavlic

PROJECT Rocky Flats
106 P06222

| TIME | | | | WATER LEVEL DATA | | | | DISCHARGE | RECORDED BY | COMMENTS |
|---------------------------|------------|---------|----------|-----------------------------------|----------------------------|-------------|---------|-----------|-------------|------------------------|
| t = <u>28.2</u> at t' = 0 | | | | STATIC WATER LEVEL <u>1420 ft</u> | | | | | | |
| DAY | CLOCK TIME | t (min) | t' (min) | READING | CONVERSIONS OF CORRECTIONS | WATER LEVEL | g or s' | READ-ING | Q | |
| 1 | 12:25 | 78 | 50 | 45+3.80 | 2.05 | 46.75 | -31.95 | | | WH |
| | 12:30 | 83 | 55 | 45+3.45 | " | 46.40 | -31.60 | | | DP |
| | 12:35 | 88 | 60 | 45+3.10 | " | 46.05 | -31.25 | | | DP |
| | 12:40 | 93 | 65 | 45+2.80 | " | 45.75 | -30.95 | | | DP |
| | 12:45 | 98 | 70 | 45+2.45 | " | 45.44 | -30.64 | | | DP |
| | 12:50 | 103 | 75 | 45+2.10 | " | 45.11 | -30.31 | | | DP |
| | 12:55 | 107 | 80 | | | | | | | DP |
| | 13:00 | 113 | -5 | 45+1.62 | | 44.57 | -29.77 | | | DP |
| | 13:10 | 123 | 95 | 45+1.10 | | 44.25 | -29.25 | | | DP |
| | 13:20 | 133 | 105 | 45+0.56 | | 43.51 | -28.71 | | | DP |
| | 13:30 | 143 | 115 | 45+0.00 | | 43.23 | -28.23 | | | DP |
| | 13:40 | 153 | 125 | 40+4.58 | | 42.53 | -27.73 | | | DP |
| | 13:50 | 165 | 137 | 40+3.93 | | 41.88 | -27.08 | | | DP |
| | 14:00 | 172 | 145 | 40+3.15 | | 41.60 | -26.80 | | | DP |
| | 14:10 | 183 | 155 | 40+3.17 | | 41.12 | -26.32 | | | DP |
| | 14:20 | 194 | 166 | 40+2.68 | | 40.63 | -25.83 | | | WH |
| | 14:30 | 203 | 175 | 40+2.33 | | 40.22 | -25.48 | | | DP |
| | 14:40 | 213 | 185 | 40+1.84 | | 39.79 | -24.99 | | | DP |
| | 14:55 | 228 | 200 | 40+1.11 | | 39.06 | -24.26 | | | DP |
| | 15:10 | 243 | 215 | 40+0.40 | | 38.43 | -23.63 | | | WH |
| | 15:25 | 258 | 230 | 35+4.87 | | 37.82 | -23.02 | | | DP |
| | 15:57 | 290 | 22 | 35+3.58 | | 36.53 | -21.73 | | | WH Problems with sound |
| | 16:10 | 303 | 275 | 35+3.11 | | 35.26 | -21.26 | | | WH Had to go out a |
| | 16:25 | 318 | 290 | 25+2.60 | | 35.55 | -20.75 | | | WH new one |
| | 16:40 | 333 | 305 | 35+2.12 | | 35.07 | -20.27 | | | WH |
| | 16:55 | 348 | 320 | 35+1.72 | | 34.67 | -19.87 | | | WH |
| | 17:10 | 363 | 335 | 35+1.24 | | 34.19 | -19.39 | | | WH |
| | 17:25 | 378 | 350 | 25+0.84 | | 33.79 | -18.99 | | | |
| | 17:55 | 408 | 380 | 25+0.06 | | 33.01 | -18.21 | | | |
| | 18:25 | 438 | 410 | 30+4.33 | | 32.28 | -17.48 | | | |
| 1 | 18:55 | 468 | 440 | 30+3.68 | | 31.63 | -16.83 | | | |
| 2 | 07:55 | 124 | 520 | 25+0.91 | | 23.86 | -7.06 | | | MB Refill with water |
| | 09:05 | 1218 | 1292 | 25+0.54 | | 23.49 | -7.69 | | | MB |
| | 09:55 | 1262 | 1340 | 25+0.27 | | 23.22 | -8.42 | | | MB |
| | 10:55 | 1428 | 1400 | 25+0.05 | | 23.00 | -8.20 | | | MB |
| | 11:55 | 1488 | 1460 | 20+4.35 | | 22.70 | -7.90 | | | MB |
| | 12:55 | 1548 | 1520 | 20+4.53 | | 22.48 | -7.68 | | | MB |
| | 13:50 | 1603 | 1575 | 20+4.29 | | 22.24 | -7.44 | | | MB |
| | 14:55 | 1668 | 1640 | 20+4.08 | | 22.23 | -7.23 | | | MB |
| 2 | 15:55 | 1728 | 1700 | 20+3.83 | | 21.78 | -6.98 | | | MB |
| 4 | 08:00 | 4133 | 4105 | 15+4.33 | | 17.28 | -2.48 | | | WH 70% recovery |
| 4 | 17:10 | 4803 | 4775 | 15+3.73 | | 16.68 | -1.88 | | | WH |

HYDRO-SEARCH

RENO • DENVER

CONSULTING HYDROLOGISTS-GEOLOGISTS

PACKER TEST ANALYSIS

WELL NO. 14-86

ROCKY FLATS PLANT JOB NO. 106P06222

DATE TESTED: 9/2/86 BY: T. GULLIVER

TEST INTERVAL (FEET BELOW G.S.): 32.46 - 43.64

MATERIAL TESTED: ARAPAHOE CLAYSTONE

DEPTH TO WATER (FEET BELOW G.S.): 10.86

$$K = \frac{Q}{2(\pi)(L)(H)} \ln\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00045692 (FEET³/MIN)

L = LENGTH OF TEST INTERVAL = 11.18 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 10.86 + 1.90 + 2.30 * 2.31 = 18.07

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000154 FT/MIN

K = .00000078 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00429001 (FEET³/MIN)

L = LENGTH OF TEST INTERVAL = 11.18 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 10.86 + 1.90 + 11.00 * 2.31 = 38.17

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000683 FT/MIN

K = .00000347 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00052039 (FEET³/MIN)

L = LENGTH OF TEST INTERVAL = 11.18 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 10.86 + 1.90 + 2.40 * 2.31 = 18.30

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000173 FT/MIN

K = .00000088 CM/SEC

PACKER TEST ANALYSIS
WELL NO. 14-86
ROCKY FLATS PLANT JOB NO. 106P06222
DATE TESTED: 9/2/86 BY: T. GULLIVER
TEST INTERVAL (FEET BELOW G.S.): 43.26 - 54.44
MATERIAL TESTED: ARAPAHOE SANDSTONE
DEPTH TO WATER (FEET BELOW G.S.): 10.86

$$K = \frac{Q}{2(\pi)(L)(H)} \ln\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00122100 (FEET³/MIN)
L = LENGTH OF TEST INTERVAL = 11.18 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 10.86 + 1.90 + 2.20 * 2.31 = 17.84
R = BOREHOLE RADIUS = .16 FEET
K = HYDRAULIC CONDUCTIVITY = .00000416 FT/MIN
K = .00000211 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00797079 (FEET³/MIN)
L = LENGTH OF TEST INTERVAL = 11.18 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 10.86 + 1.90 + 9.00 * 2.31 = 33.55
R = BOREHOLE RADIUS = .16 FEET
K = HYDRAULIC CONDUCTIVITY = .00001444 FT/MIN
K = .00000734 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00037995 (FEET³/MIN)
L = LENGTH OF TEST INTERVAL = 11.18 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 10.86 + 1.90 + 2.30 * 2.31 = 18.07
R = BOREHOLE RADIUS = .16 FEET
K = HYDRAULIC CONDUCTIVITY = .00000128 FT/MIN
K = .00000065 CM/SEC

PACKER TEST ANALYSIS
WELL NO. 14-86
ROCKY FLATS PLANT JOB NO. 106P06222
DATE TESTED: 9/2/86 BY: T. GULLIVER
TEST INTERVAL (FEET BELOW G.S.): 53.91 - 65.09
MATERIAL TESTED: ARAPAHOE CLAYSTONE
DEPTH TO WATER (FEET BELOW G.S.): 10.86

$$K = \frac{Q}{2(PI)(L)(H)} \frac{L}{LN(\frac{L}{R})}$$

1ST P1/3 TEST

Q = INJECTION RATE = .00013539 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 11.18 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 10.86 + 1.90 + 1.70 * 2.31 = 16.69
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000049 FT/MIN
K = .00000025 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00457975 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 11.18 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 10.86 + 1.90 + 20.00 * 2.31 = 58.96
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000472 FT/MIN
K = .00000240 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00013962 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 11.18 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 10.86 + 1.90 + 2.40 * 2.31 = 18.30
R = BOREHOLE RADIUS = .16 FEET

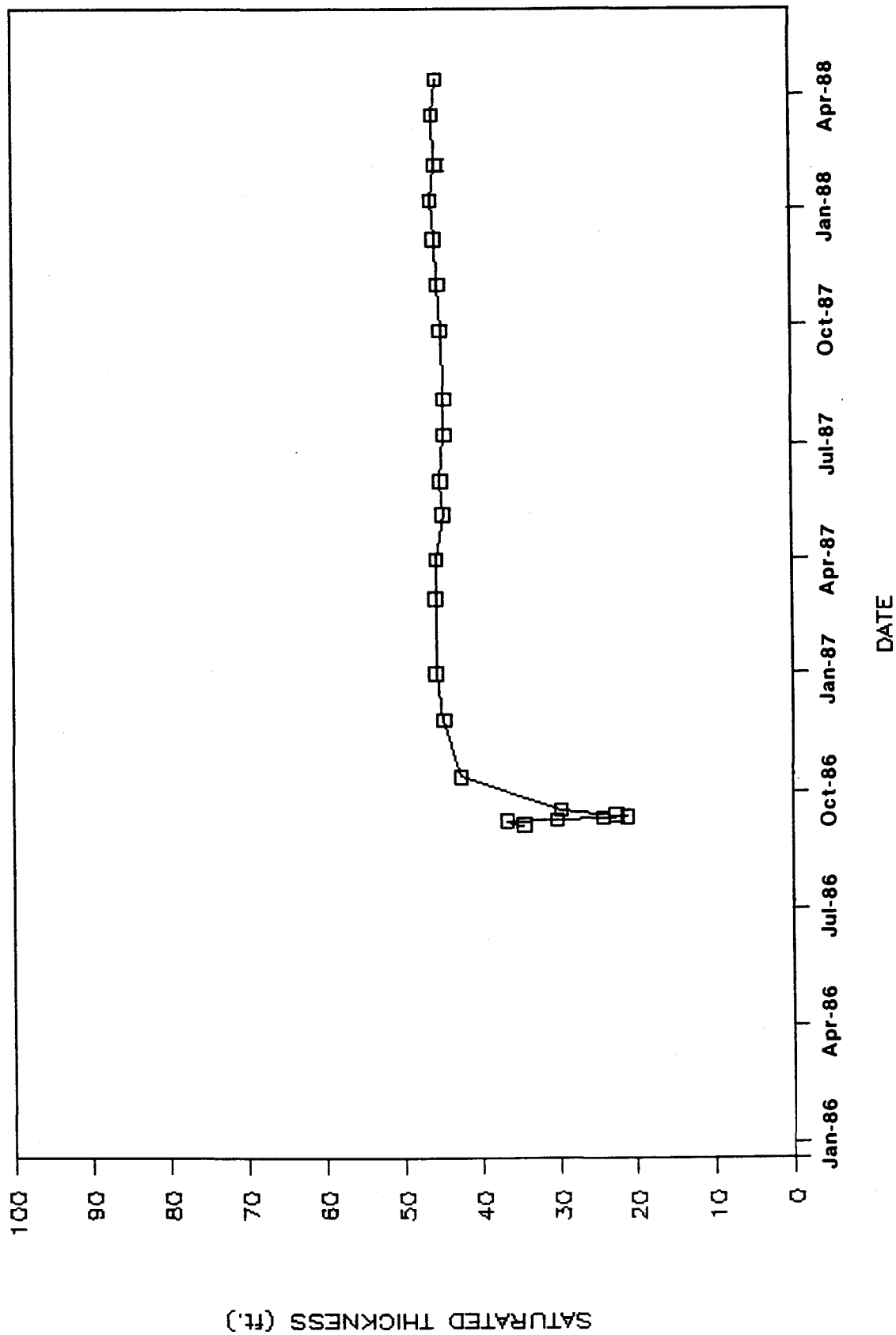
K = HYDRAULIC CONDUCTIVITY = .00000046 FT/MIN
K = .00000024 CM/SEC

ROCKY FLATS SOLAR PONDS

WATER LEVEL SUMMARY

| <u>WELL</u> <u>NUMBER</u> | <u>DATE</u> | <u>GROUND</u> <u>SURFACE</u> <u>ELEVATION</u> | <u>TOP OF</u> <u>CASING</u> <u>ELEVATION</u> | <u>STICK</u> <u>UP</u> | <u>DEPTH</u> <u>OF SI</u> <u>BASE</u> | <u>WATER</u> <u>DEPTH</u> <u>BELOW TOC</u> | <u>WATER</u> <u>SURFACE</u> <u>ELEVATION</u> |
|------------------------------|-------------|---|--|---------------------------|---|--|--|
| 1486 | 09/05/86 | 5844.71 | 5846.71 | 2.00 | 55.36 | 20.90 | 5825.81 |
| | 09/08/86 | | | | | 18.79 | 5827.92 |
| | 09/09/86 | | | | | 25.22 | 5821.49 |
| | 09/11/86 | | | | | 31.12 | 5815.59 |
| | 09/12/86 | | | | | 34.23 | 5812.48 |
| | 09/13/86 | | | | | 32.84 | 5813.87 |
| | 09/17/86 | | | | | 25.68 | 5821.03 |
| | 10/13/86 | | | | | 12.91 | 5833.80 |
| | 11/26/86 | | | | | 10.64 | 5836.07 |
| | 01/01/87 | | | | | 9.67 | 5837.04 |
| | 03/02/87 | | | | | 9.67 | 5837.04 |
| | 04/01/87 | | | | | 9.85 | 5836.86 |
| | 05/06/87 | | | | | 10.77 | 5835.94 |
| | 06/01/87 | | | | | 10.39 | 5836.32 |
| | 07/08/87 | | | | | 10.90 | 5835.81 |
| | 08/05/87 | | | | | 10.90 | 5835.81 |
| | 09/28/87 | | | | | 10.50 | 5836.21 |
| | 11/03/87 | | | | | 10.20 | 5836.51 |
| | 12/08/87 | | | | | 9.70 | 5837.01 |
| | 01/07/88 | | | | | 9.30 | 5837.41 |
| | 02/04/88 | | | | | 9.90 | 5836.81 |
| | 03/14/88 | | | | | 9.60 | 5837.11 |
| | 04/11/88 | | | | | 10.10 | 5836.61 |

SATURATED THICKNESS IN WELL # 14-86 (SP)



INDEX OF DATA

Boring No.: 15-86

Completed as well? Yes

Data in File

- ☒ Log of Borehole
- ☒ Well Construction Summaries
- ☐ Well Development Summaries
- ☒ Hydraulic Conductivity Test Data and Results
- ☐ Packer Test Data and Results
- ☒ Water Level Data
- ☒ Saturated Thickness Hydrographs

Project: Rocky Flats Plant

LOG OF BORING NO. 15-86

Date Drilled 8/18/86

Coordinates N 38862.9 E 22711.3

Boring Method - Hollow Stem Auger

Ground Surface Elevation 5845.61

| Elev. (feet) | Depth (feet) | Sample Type | Graphic Log | Material Description | Penetration Resistance (Blows/Inch) | | Water Content (%) | | Other Tests |
|-----------------|-----------------|----------------|----------------|--|---|----|-------------------------|----|----------------|
| | | | | | 20 | 40 | 20 | 40 | |
| | 0 | | | VALLEY FILL ALLUVIUM | | | | | |
| | | | | 0-0.4'-Sample. Recovered 0.4/0.4'=100%. Medium CLAY: dark gray (N 4) top soil; trace granitic pebbles; poorly sorted; unconsolidated; dry. | | | ▽ | | |
| | 5 | | | 0.4-5.0'-Sample. Recovered 4.0/4.6'=87%. GRAVEL: dark yellowish brown (10YR 4/2) to dusky yellowish brown (10YR 2/2) granitic and micaceous pebbles and cobbles with some clayey silt; poorly sorted; trace of iron stains; unconsolidated; dry. | | | ▽ | | |
| | 10 | | | 5.0-6.0'-Sample. Recovered 1.0/1.0'=100%. GRAVEL: moderate yellowish brown (5YR 3/4) and pale yellowish brown (10YR 6/2) granitic pebbles and cobbles in a sand and silt matrix; poorly sorted; unconsolidated; dry. | | | | | |
| | | | | 6.0-8.0'-Sample. Recovered 1.0/2.0'=50%. CLAY: dark yellowish brown (10YR 4/2) silty clay; trace granitic pebbles; grades to black clay at 7.7'; unconsolidated; moist. | | | | | |
| | 15 | | | 8.0-10.5'-Sample. Recovered 2.1/2.5'=84%. GRAVEL: dark yellowish brown (10YR 4/2) granitic pebbles in silty clay matrix; poorly sorted; unconsolidated; wet. | | | | | |
| | | | | 10.5-13.0'-Sample. Recovered 1.4/2.5'=100%. | | | | | |
| | | | | 10.5-12.5'. GRAVEL: dark yellowish brown (10YR 4/2) granitic pebbles in silty clay matrix; poorly sorted; unconsolidated; wet. | | | | | |
| | 20 | | | ARAPAHOE FORMATION | | | | | |

Remarks

Logged by: L. Pivonka

Checked by:

Project No.

106P06222

Hydro-Search, Inc.

Page 1 of 2

Project: Rocky Flats Plant

LOG OF BORING NO. 15-86

Date Drilled 8/18/86

Coordinates N 38862.9 E 22711.3

Boring Method Hollow Stem Auger

Ground Surface Elevation 5845.61

| Elev. (feet) | Depth (feet) | Sample Type | Graphic Log | Material Description | Penetration Resistance (Blows/inch) | | Water Content (%) | | Other Tests |
|-----------------|-----------------|----------------|----------------|---|---|----|-------------------------|----|----------------|
| | | | | | 20 | 40 | 20 | 40 | |
| | 20 | | | 12.5-13.0'. CLAYSTONE: dark yellowish brown (10YR 4/2); trace iron staining; weathered; moist. | | | | | |
| | | | | 13.0-15.5'-Sample. Recovered 2.5/2.5'=100%. CLAYSTONE: light olive gray (5Y 6/1) and dusky yellowish brown (10YR 2/2); weathered; dry. | | | | | |
| | 25 | | | 15.5-18.0'-Sample. Recovered 2.5/2.5'=100%. CLAYSTONE: light olive gray (5Y 6/1); trace iron staining; weathered; dry. | | | | | |
| | | | | TOTAL DEPTH: 18.0' | | | | | |
| | 30 | | | | | | | | |
| | 35 | | | | | | | | |
| | 40 | | | | | | | | |

Remarks

Logged by: L. Pivonka

Checked by: *[Signature]*

Project No.
106P06222

Hydro-Search, Inc.

Page 2 of 2

WELL CONSTRUCTION SUMMARY

LOCATION or COORDS: _____
N 38862.9 E 22711.3

ELEVATION: GROUND LEVEL 5845.61'
TOP OF CASING 5847.93'

DRILLING SUMMARY:

TOTAL DEPTH Well: 14.69' Hole: 18.00'

BOREHOLE DIAMETER 7 1/4"

DRILLER Boyles Brothers Drilling Co.

15865 W. 5th Avenue

Golden, CO (Jim Horn)

RIG Mobile B-57

BIT(S) Bull nose bit

DRILLING FLUID None

SURFACE CASING 5" x 5' steel w/ locking cap

WELL DESIGN:

BASIS: GEOLOGIC LOG X GEOPHYSICAL LOG

CASING STRING(S): C= CASING S= SCREEN

0.00' 4.09' C1

4.09' 14.69' S1

CASING: C1 2" I.D. Sch. 5 type 316 stain-
less steel threaded and flush
jointed.

SCREEN: SI 2" I.D. Sch. 5 type 316 stain-
less steel, threaded and flush
jointed, 0.010" wire wrap screen
0.25' welded bottom cap.

CENTRALIZERS Type 304 stainless steel
8.34' - 9.52'

FILTER MATERIAL 12-20 silica sand
3.00' - 18.00'

CEMENT Portland Type I
0.00' - 2.00'

OTHER 3/8" bentonite pellets
2.00' - 3.00'

CONSTRUCTION TIME LOG:

| TASK | START | | FINISH | |
|-------------------|--------------|------|--------------|------|
| | DATE 1986 | TIME | DATE 1986 | TIME |
| DRILLING: | | | | |
| 7½" auger | 8/18 | 1405 | 8/18 | 1705 |
| | | | | |
| | | | | |
| GEOPHYS. LOGGING: | — | — | — | — |
| CASING: | | | | |
| 2" stainless | 8/18 | 1705 | 8/18 | 1707 |
| | | | | |
| | | | | |
| FILTER PLACEMENT: | 8/18 | 1707 | 8/18 | 1720 |
| CEMENTING: | 8/18 | 1725 | 8/18 | 1730 |
| DEVELOPMENT: | 8/27 | 1205 | 9/9 | 1000 |
| OTHER: | | | | |
| Bentonite | 8/18 | 1720 | 8/18 | 1722 |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

WELL DEVELOPMENT

See Well Development Summary Sheet.

COMMENTS:

Water encountered at 6.5' during drilling.

Top of stainless steel casing: 2.32'



SHEET ____ of ____

CLIENT/SUBJECT _____ W.O. NO. _____

TASK DESCRIPTION _____ TASK NO. _____

PREPARED BY _____ DEPT _____ DATE _____

APPROVED BY

MATH CHECK BY _____ DEPT _____ DATE _____

METHOD REV. BY _____ DEPT _____ DATE _____

DEPT _____ DATE _____

WELL 15-86

Hydraulic Conductivity = NA

Flowrate (gpm) = 0.872

Screened Interval (ft below G.L.) = 4.33 (Static W.L.) - 14.69'

Method of Analysis: Residual-drawdown Plot

(Driscoll, 1986 pg 256).

CLIENT/SUBJECT _____ W.O. NO. _____

TASK DESCRIPTION _____ TASK NO. _____

PREPARED BY _____ DEPT _____ DATE _____

MATH CHECK BY _____ DEPT _____ DATE _____

METHOD REV. BY _____ DEPT _____ DATE _____

| | |
|-------------|------------|
| APPROVED BY | |
| | |
| DEPT _____ | DATE _____ |

WELL 15-86

$$T \text{ (gpd/ft)} = \frac{264 Q}{\Delta S'} = \frac{(264) (0.872)}{24} = 9.59$$

where $Q \text{ (gpm)} = 20.5 \text{ gallons} / 23.5 \text{ minutes} = 0.872 \text{ gpm}$

$$\Delta S' = \text{2 ft. change in residual drawdown / log cycle}$$

$$= 24' / \text{log cycle (see attached plot)}$$

$$K \text{ (gpd/ft}^2\text{)} = T/b = 9.59 / 10.36 = .926$$

where $b \text{ (ft)} = 14.69 \text{ (Base of screen)} - 4.33 \text{ (Static W.L.)} = 10.36'$

$$K \text{ (cm/sec)} = 0.926 \text{ gpd/ft}^2 \times \frac{4.72 \times 10^{-5} \text{ cm/sec}}{\text{gpd/ft}^2} = 4.3 \times 10^{-5}$$

This method is valid where $u \leq 0.01$

solving for t for $u \leq 0.01$

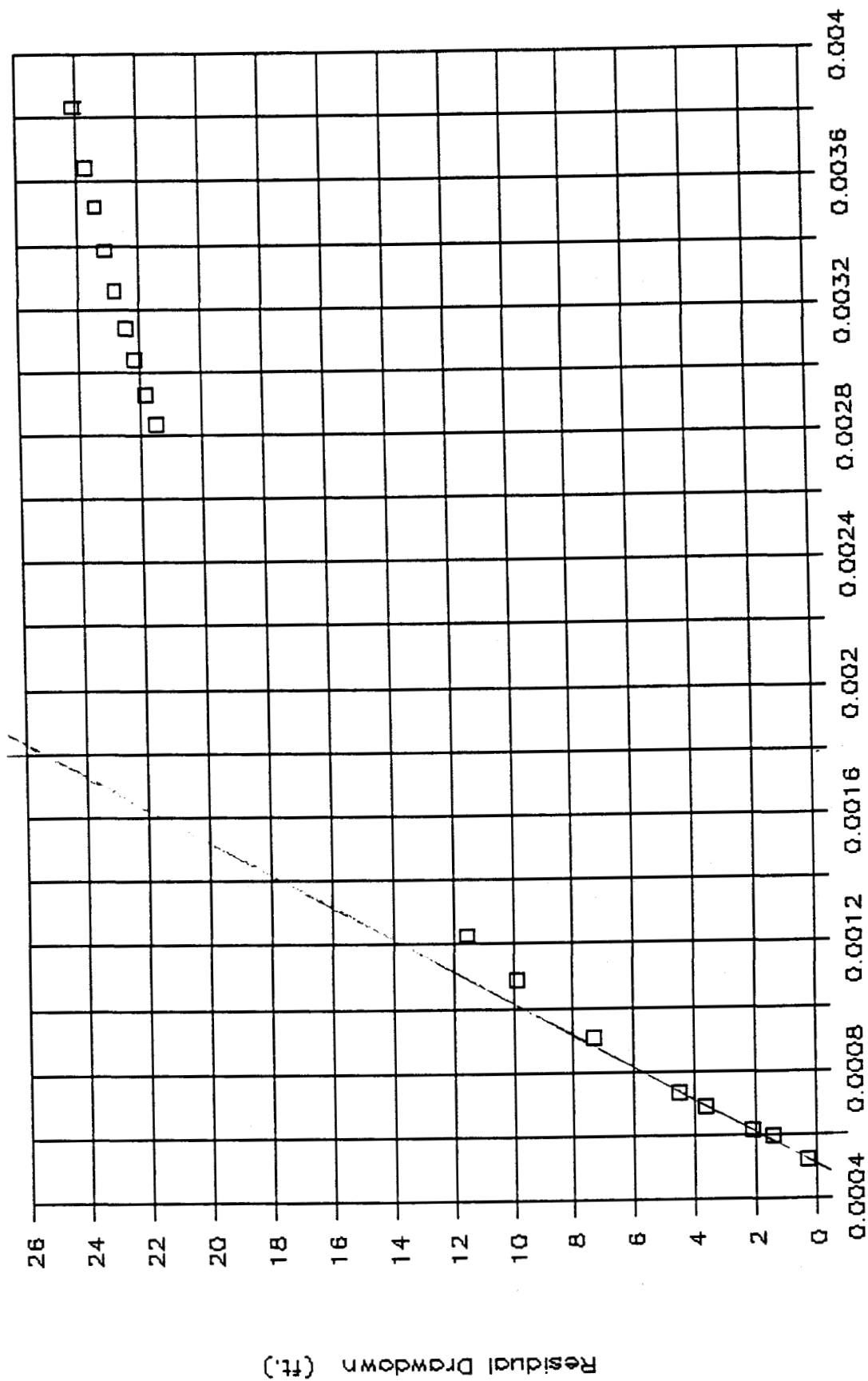
$$t \text{ (min)} = \frac{r^2 S}{4 T u} = \frac{(0.3)^2 \times .1}{4 (9.59) (.01)} \times \frac{1440 \text{ min}}{\text{day}} \times \frac{7.482 \text{ gal}}{\text{ft}^3}$$

$$= 253 \text{ min}$$

where $r \text{ (ft)} = \left(\frac{7.25}{24} \right) \text{ ft} = (0.30) \text{ ft}$

$S = 0.1$ assumed S for unconfined aquifers.
 $\Delta S'$ is invalid.

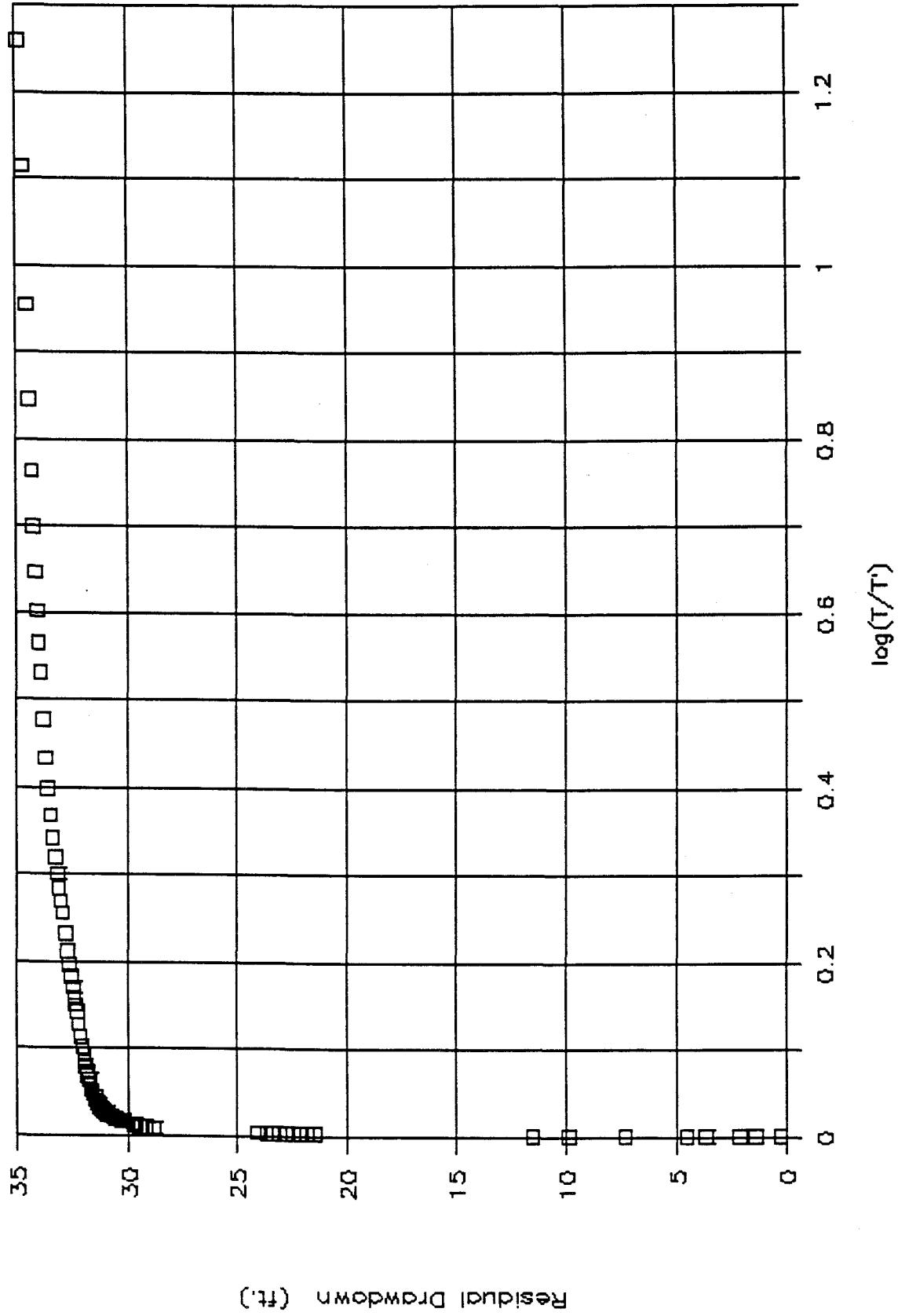
WELL 16-86



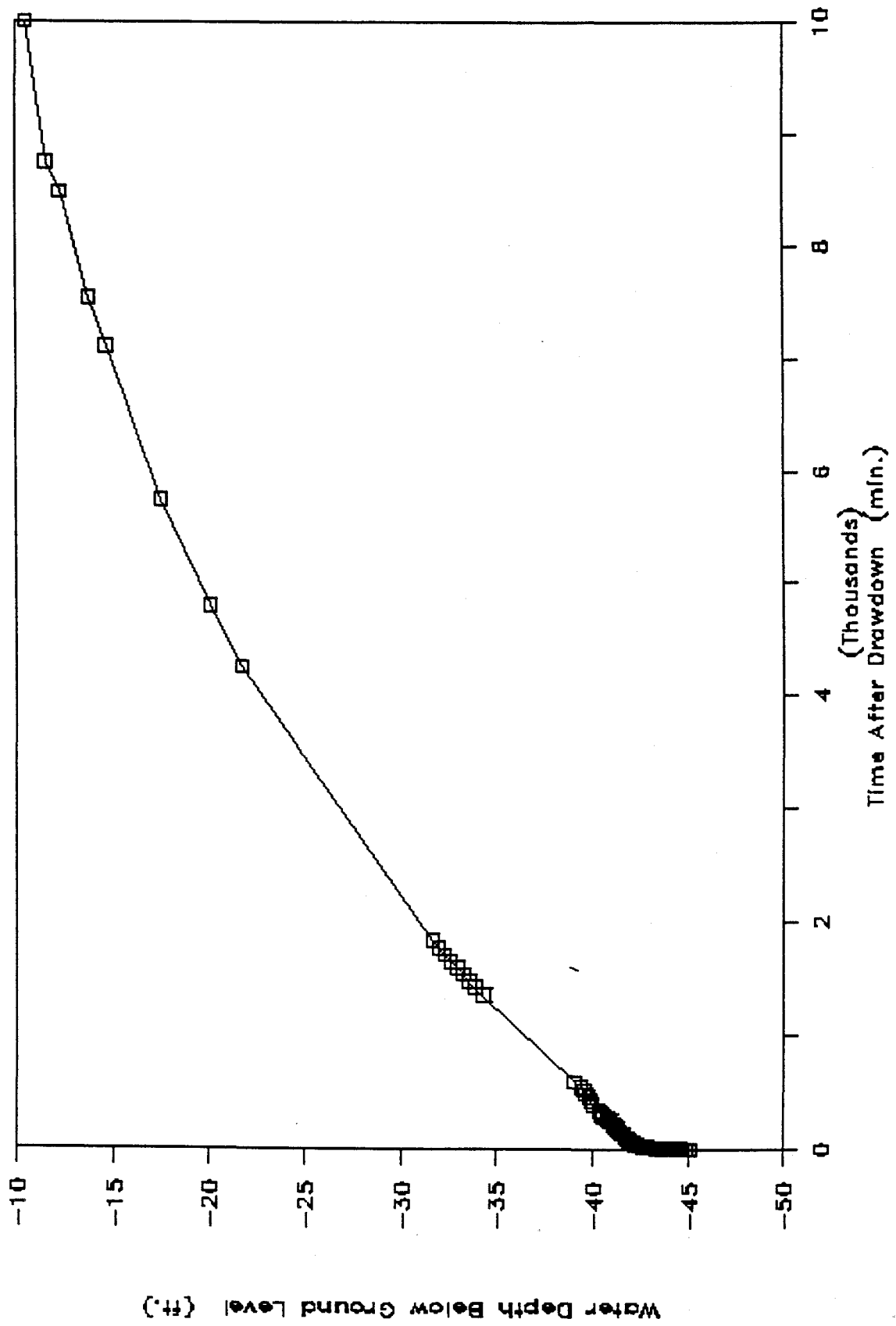
$\log(T/T')$

$$\Delta S' = \frac{(26 - 0) \text{ ft}}{0.00203 - 0.00051} = 17,100 \text{ ft} / \log \frac{1}{1.2}$$

WELL 16-86



WELL 16-86



WELL 16-86

| T Time (min.) | T' T Prime (min.) | Water Level (ft.) | s' Rsd Drwn (ft.) | log(T/T') |
|---------------------|-------------------------|-------------------------|-------------------------|-----------|
| 137.00 | 125.00 | 41.63 | 31.45 | 0.04 |
| 147.00 | 135.00 | 41.52 | 31.34 | 0.04 |
| 157.00 | 145.00 | 41.44 | 31.26 | 0.03 |
| 167.00 | 155.00 | 41.43 | 31.25 | 0.03 |
| 177.00 | 165.00 | 41.34 | 31.16 | 0.03 |
| 187.00 | 175.00 | 41.30 | 31.12 | 0.03 |
| 197.00 | 185.00 | 41.29 | 31.11 | 0.03 |
| 212.00 | 200.00 | 41.17 | 30.99 | 0.03 |
| 227.00 | 215.00 | 41.11 | 30.93 | 0.02 |
| 257.00 | 245.00 | 40.86 | 30.68 | 0.02 |
| 272.00 | 260.00 | 40.77 | 30.59 | 0.02 |
| 287.00 | 275.00 | 40.69 | 30.51 | 0.02 |
| 302.00 | 290.00 | 40.58 | 30.40 | 0.02 |
| 317.00 | 305.00 | 40.47 | 30.29 | 0.02 |
| 332.00 | 320.00 | 40.40 | 30.22 | 0.02 |
| 347.00 | 335.00 | 40.32 | 30.14 | 0.02 |
| 401.00 | 389.00 | 39.97 | 29.79 | 0.01 |
| 437.00 | 425.00 | 39.92 | 29.74 | 0.01 |
| 467.00 | 455.00 | 39.77 | 29.59 | 0.01 |
| 497.00 | 485.00 | 39.64 | 29.46 | 0.01 |
| 527.00 | 515.00 | 39.54 | 29.36 | 0.01 |
| 557.00 | 545.00 | 39.36 | 29.18 | 0.01 |
| 596.00 | 584.00 | 39.04 | 28.86 | 0.01 |
| 1366.00 | 1354.00 | 34.26 | 24.08 | 0.00 |
| 1436.00 | 1424.00 | 33.86 | 23.68 | 0.00 |
| 1486.00 | 1474.00 | 33.58 | 23.40 | 0.00 |
| 1546.00 | 1534.00 | 33.29 | 23.11 | 0.00 |
| 1606.00 | 1594.00 | 32.96 | 22.78 | 0.00 |
| 1666.00 | 1654.00 | 32.61 | 22.43 | 0.00 |
| 1721.00 | 1709.00 | 32.32 | 22.14 | 0.00 |
| 1786.00 | 1774.00 | 32.00 | 21.82 | 0.00 |
| 1846.00 | 1834.00 | 31.67 | 21.49 | 0.00 |
| 4257.00 | 4245.00 | 21.72 | 11.54 | 0.00 |
| 4809.00 | 4797.00 | 20.06 | 9.88 | 0.00 |
| 5756.00 | 5744.00 | 17.50 | 7.32 | 0.00 |
| 7116.00 | 7104.00 | 14.70 | 4.52 | 0.00 |
| 7551.00 | 7539.00 | 13.83 | 3.65 | 0.00 |
| 8491.00 | 8479.00 | 12.31 | 2.13 | 0.00 |
| 8756.00 | 8744.00 | 11.62 | 1.44 | 0.00 |
| 10011.00 | 9999.00 | 10.50 | 0.32 | 0.00 |

WELL 16-86

| T Time (min.) | T' T Prime (min.) | Water Level (ft.) | s' Rsd Drwn (ft.) | log(T/T') |
|---------------------|-------------------------|-------------------------|-------------------------|-----------|
| 12.70 | 0.70 | 45.06 | 34.88 | 1.26 |
| 13.00 | 1.00 | 44.87 | 34.69 | 1.11 |
| 13.50 | 1.50 | 44.69 | 34.51 | 0.95 |
| 14.00 | 2.00 | 44.59 | 34.41 | 0.85 |
| 14.50 | 2.50 | 44.46 | 34.28 | 0.76 |
| 15.00 | 3.00 | 44.39 | 34.21 | 0.70 |
| 15.50 | 3.50 | 44.32 | 34.14 | 0.65 |
| 16.00 | 4.00 | 44.25 | 34.07 | 0.60 |
| 16.50 | 4.50 | 44.17 | 33.99 | 0.56 |
| 17.00 | 5.00 | 44.09 | 33.91 | 0.53 |
| 18.00 | 6.00 | 43.99 | 33.81 | 0.48 |
| 19.00 | 7.00 | 43.88 | 33.70 | 0.43 |
| 20.00 | 8.00 | 43.76 | 33.58 | 0.40 |
| 21.00 | 9.00 | 43.64 | 33.46 | 0.37 |
| 22.00 | 10.00 | 43.54 | 33.36 | 0.34 |
| 23.00 | 11.00 | 43.44 | 33.26 | 0.32 |
| 24.00 | 12.00 | 43.35 | 33.17 | 0.30 |
| 25.00 | 13.00 | 43.27 | 33.09 | 0.28 |
| 26.00 | 14.00 | 43.19 | 33.01 | 0.27 |
| 27.00 | 15.00 | 43.12 | 32.94 | 0.26 |
| 29.00 | 17.00 | 43.00 | 32.82 | 0.23 |
| 31.00 | 19.00 | 42.88 | 32.70 | 0.21 |
| 33.00 | 21.00 | 42.79 | 32.61 | 0.20 |
| 35.00 | 23.00 | 42.68 | 32.50 | 0.18 |
| 37.00 | 25.00 | 42.62 | 32.44 | 0.17 |
| 39.00 | 27.00 | 42.57 | 32.39 | 0.16 |
| 41.00 | 29.00 | 42.52 | 32.34 | 0.15 |
| 43.00 | 31.00 | 42.43 | 32.25 | 0.14 |
| 47.00 | 35.00 | 42.38 | 32.20 | 0.13 |
| 52.00 | 40.00 | 42.31 | 32.13 | 0.11 |
| 57.00 | 45.00 | 42.22 | 32.04 | 0.10 |
| 62.00 | 50.00 | 42.13 | 31.95 | 0.09 |
| 67.00 | 55.00 | 42.12 | 31.94 | 0.09 |
| 72.00 | 60.00 | 42.07 | 31.89 | 0.08 |
| 77.00 | 65.00 | 42.00 | 31.82 | 0.07 |
| 82.00 | 70.00 | 41.98 | 31.80 | 0.07 |
| 87.00 | 75.00 | 41.92 | 31.74 | 0.06 |
| 92.00 | 80.00 | 41.86 | 31.68 | 0.06 |
| 97.00 | 85.00 | 41.85 | 31.67 | 0.06 |
| 107.00 | 95.00 | 41.82 | 31.64 | 0.05 |
| 117.00 | 105.00 | 41.75 | 31.57 | 0.05 |
| 127.00 | 115.00 | 41.65 | 31.47 | 0.04 |

AQUIFER TEST DATA

WELL 16-126
PUMPING or OBSERVATION WELL
PUMPING or RECOVERY DATA
PAGE 1 OF 3

TYPE OF AQUIFER TEST Fail-down-Recovery
HOW Q MEASURED 4 1/2 gallon bucket
HOW W.L.'s MEASURED Olympic well sounder
RAD./DIST. OF/FROM PUMPING WELL 0
MEAS. POINT FOR W.L.'s N. side of inner casing
ELEVATION OF MEAS. POINT ?

DEPTH OF PUMP/AIRPIPE _____
PUMP ON: date _____ time _____
PUMP OFF: date _____ time _____
DURATION OF AQUIFER TEST _____

LOCATION Rocky Flats Plant, Denver, CO
PERSONNEL W. Hirst & D. Barlett

PROJECT 106-1-6-222

| TIME | | | | WATER LEVEL DATA | | | | DISCHARGE | | RECORDED BY | COMMENTS |
|-------------------------|------------|---------|----------|-------------------------------------|----------------------------|-------------|---------|-----------|---|-------------|----------------------|
| t = <u>12</u> at t' = 0 | | | | STATIC WATER LEVEL <u>10.18 - 7</u> | | | | READ-ING | Q | | |
| DAY | CLOCK TIME | t (min) | t' (min) | READING | CONVERSIONS OF CORRECTIONS | WATER LEVEL | s or s' | | | | |
| 10 | 09 | | | 10+2.26 | 2.02 | 10.18 | 0 | | | W.H. | repaired W.L. |
| | 0914 | | | | | | | | | " | T.D. = 45.09+ |
| | 0915:15 | 1.25 | | | | | | 1 gal | | " | Bail 1 gallon |
| | 0916:45 | 2.75 | | | | | | 1 gal | | " | Bail 1 gallon |
| | 0918:25 | 4.4 | | | | | | 1 gal | | " | Bail 1 gallon |
| | 0920:00 | 6 | | | | | | 1 gal | | " | Bail 1 gallon |
| | 0922:05 | 8.1 | | | | | | 1 gal | | " | Bail 1 gallon |
| | 0924:45 | 10.75 | | | | | | 1 gal | | " | Bail 1 gallon |
| | 0926:00 | 12 | 0 | | | | | | | | Remove bailer |
| | 0926:40 | 12.7 | 2.7 | 45+2.14 | 2.02 | 45.20 | -34.66 | | | | 90% recovery = 13.67 |
| | 0927:03 | 13 | 1 | 45+1.95 | | 44.87 | -34.22 | | | | |
| | 0927:30 | 13.5 | 1.5 | 45+1.77 | | 44.69 | -34.51 | | | | |
| | 0928:00 | 14 | 2 | 45+1.67 | | 44.59 | -34.41 | | | | |
| | 0928:33 | 14.5 | 2.5 | 45+1.54 | | 44.46 | -34.28 | | | " | |
| | 0929:00 | 15 | 3 | 45+1.47 | | 44.39 | -34.21 | | | " | |
| | 0929:30 | 15.5 | 3.5 | 45+1.40 | | 44.32 | -34.14 | | | " | |
| | 0930:00 | 16 | 4 | 45+1.33 | | 44.25 | -34.07 | | | " | |
| | 0930:30 | 16.5 | 4.5 | 45+1.26 | | 44.17 | -33.99 | | | " | |
| | 0931:00 | 17 | 5 | 45+1.17 | | 44.09 | -33.91 | | | " | |
| | 0932:00 | 18 | 6 | 45+1.08 | | 43.99 | -33.81 | | | " | |
| | 0933:00 | 19 | 7 | 45+0.96 | | 43.88 | -33.70 | | | " | |
| | 0934:00 | 20 | 8 | 45+0.84 | | 43.76 | -33.58 | | | " | |
| | 0935:00 | 21 | 9 | 45+0.72 | | 43.64 | -33.46 | | | " | |
| | 0936:00 | 22 | 10 | 45+0.62 | | 43.54 | -33.36 | | | " | |
| | 0937:00 | 23 | 11 | 45+0.52 | | 43.44 | -33.26 | | | " | |
| | 0938:00 | 24 | 12 | 45+0.43 | | 43.35 | -33.17 | | | " | |
| | 0939:00 | 25 | 13 | 45+0.35 | | 43.27 | -33.09 | | | " | |
| | 0940:00 | 26 | 14 | 45+0.27 | | 43.19 | -33.01 | | | " | |
| | 0941:00 | 27 | 15 | 45+0.20 | | 43.12 | -32.94 | | | " | |
| | 0943:00 | 29 | 17 | 45+0.08 | | 43.00 | -32.82 | | | " | |
| | 0945:00 | 31 | 19 | 45+0.96 | | 42.88 | -32.70 | | | " | |
| | 0947:00 | 33 | 21 | 45+0.84 | | 42.79 | -32.61 | | | " | |
| | 0949:00 | 35 | 23 | 45+0.76 | | 42.71 | -32.53 | | | " | |
| | 0951:00 | 37 | 25 | 45+0.70 | | 42.62 | -32.44 | | | " | |
| | 0953:00 | 39 | 27 | 45+0.65 | | 42.57 | -32.39 | | | " | |
| | 0955:00 | 41 | 29 | 45+0.60 | | 42.52 | -32.34 | | | " | |
| | 0957:00 | 43 | 31 | 45+0.51 | | 42.43 | -32.25 | | | " | |
| | 0959:00 | 45 | 33 | 45+0.49 | | 42.43 | -32.25 | | | " | |
| | 1001:00 | 47 | 35 | 45+0.46 | | 42.38 | -32.20 | | | " | |
| | 1003:00 | 49 | 37 | 45+0.39 | | 42.31 | -32.13 | | | " | |
| | 1005:00 | 51 | 39 | 45+0.30 | | 42.22 | -32.04 | | | " | |

AQUIFER TEST DATA

WELL 16-86
 PUMPING or OBSERVATION WELL
 PUMPING or RECOVERY DATA
 PAGE 2 OF 3

TYPE OF AQUIFER TEST Drill down - Recovery
 HOW Q MEASURED 4 1/2 gallon Bucket
 HOW W.L.'s MEASURED Olympic Well Sounder
 RAD./DIST. OF/FROM PUMPING WELL 0
 MEAS. POINT FOR W.L.'s N. 1/2 of water casing
 ELEVATION OF MEAS. POINT _____

DEPTH OF PUMP/AIRPIPE _____
 PUMP ON: date _____ time _____
 PUMP OFF: date _____ time _____
 DURATION OF AQUIFER TEST _____

LOCATION Rocky Flats Plant, Golden, CO
 PERSONNEL W. Hersh B. Van Dijk

PROJECT 106 P06.222

| TIME | | | | WATER LEVEL DATA | | | | DISCHARGE | | RECORDED BY | COMMENTS |
|--------------------------|------------|------|------|--------------------------|----------------------------|-------------|----------|-----------|---|-------------|--------------------------|
| t = 12 at t' = 0 | | | | STATIC WATER LEVEL 10.18 | | | | | | | |
| DAY | CLOCK TIME | (m) | (m) | READING (ft) | CONVERSIONS OF CORRECTIONS | WATER LEVEL | ' or 's' | READING | Q | | |
| 1 | 1016 | 62 | 50 | 40+4.21 | -2.08 | 42.13 | -31.95 | | | WH | 2" STICK UP |
| | 1021 | 67 | 55 | 40+4.20 | " | 42.12 | -31.94 | | | WH | |
| " | 1026 | 72 | 60 | 40+4.15 | " | 42.07 | -31.89 | | | WH | |
| " | 1031 | 77 | 65 | 40+4.08 | " | 42.00 | -31.82 | | | WH | |
| " | 1036 | 82 | 70 | 40+4.06 | " | 41.98 | -31.80 | | | WH | |
| " | 1041 | 87 | 75 | 40+4.00 | " | 41.92 | -31.74 | | | WH | |
| " | 1046 | 92 | 80 | 40+3.94 | " | 41.86 | -31.68 | | | WH | |
| " | 1051 | 97 | 85 | 40+3.13 | " | 41.25 | -31.67 | | | WH | |
| " | 1101 | 107 | 95 | 40+3.20 | " | 41.32 | -31.64 | | | WH | |
| " | 1111 | 117 | 105 | 40+3.23 | " | 41.35 | -31.57 | | | WH | |
| " | 1121 | 127 | 115 | 40+3.25 | " | 41.35 | -31.47 | | | WH | |
| " | 1131 | 137 | 125 | 40+3.71 | " | 41.63 | -31.45 | | | WH | |
| " | 1141 | 147 | 135 | 40+3.47 | " | 41.52 | -31.34 | | | WH | |
| " | 1151 | 157 | 145 | 40+3.52 | " | 41.44 | -31.26 | | | WH | |
| " | 1201 | 167 | 155 | 40+3.51 | " | 41.43 | -31.25 | | | WH | |
| " | 1211 | 177 | 165 | 40+3.72 | " | 41.34 | -31.16 | | | WH | |
| " | 1221 | 187 | 175 | 40+3.37 | " | 41.30 | -31.12 | | | WH | |
| " | 1231 | 197 | 185 | 40+2.57 | " | 41.29 | -31.11 | | | WH | |
| " | 1246 | 212 | 200 | 40+3.25 | " | 41.17 | -30.99 | | | WH | |
| " | 1251 | 227 | 215 | 40+3.11 | " | 41.11 | -30.93 | | | WH | |
| " | 1301 | 242 | 230 | 40+3.27 | " | 41.01 | -30.83 | | | WH | |
| " | 1313 | 257 | 245 | 40+2.94 | " | 40.86 | -30.68 | | | WH | |
| " | 1316 | 272 | 260 | 40+2.15 | " | 40.77 | -30.59 | | | WH | |
| " | 1321 | 287 | 275 | 40+2.77 | " | 40.69 | -30.51 | | | WH | |
| " | 1330 | 302 | 290 | 40+2.66 | " | 40.58 | -30.40 | | | WH | |
| " | 1331 | 317 | 305 | 40+2.55 | " | 40.47 | -30.29 | | | WH | |
| " | 1341 | 332 | 320 | 40+2.42 | " | 40.40 | -30.16 | | | WH | |
| " | 1351 | 347 | 335 | 40+2.40 | " | 40.32 | -30.08 | | | WH | |
| " | 1405 | 401 | 329 | 40+2.05 | " | 39.97 | -29.79 | | | WH | |
| " | 1431 | 427 | 425 | 40+2.00 | " | 39.92 | -29.74 | | | WH | |
| " | 1451 | 467 | 455 | 40+1.85 | " | 39.77 | -29.59 | | | WH | |
| " | 1501 | 497 | 485 | 40+1.72 | " | 39.64 | -29.46 | | | WH | |
| " | 1501 | 527 | 515 | 40+1.62 | " | 39.54 | -29.36 | | | OP | |
| " | 1531 | 557 | 545 | 40+1.44 | " | 39.36 | -29.18 | | | OP | |
| " | 1910 | 576 | 564 | 40+1.12 | " | 39.24 | -28.86 | | | WH | |
| INTER 1340s DR. K. N. H. | | | | | | | | | | | |
| 2 | 8:00 | 1366 | 1354 | 35+4.34 | -2.08 | 34.26 | -24.08 | | | JP | Inter 13 hours overnight |
| " | 09:10 | 1436 | 1424 | 35+4.94 | " | 33.86 | -23.68 | | | JP | |
| " | 10:10 | 1486 | 1474 | 35+0.66 | " | 33.58 | -23.40 | | | JP | |
| " | 11:00 | 1546 | 1534 | 35+0.37 | " | 33.29 | -23.11 | | | JP | |
| " | 12:00 | 1606 | 1594 | 35+0.04 | " | 32.96 | -22.78 | | | JP | |

AQUIFER TEST DATA

WELL 16-86
PUMPING or OBSERVATION WELL
PUMPING or RECOVERY DATA
PAGE 3 OF 3

TYPE OF AQUIFER TEST Bail Down - Recovery
HOW Q MEASURED 4.5 gallon bucket
HOW W.L.'s MEASURED OLYMPIC 20" sounder
RAD./DIST. OF/FROM PUMPING WELL 7
MEAS. POINT FOR W.L.'s 4 side - casing
ELEVATION OF MEAS. POINT ?

DEPTH OF PUMP/AIRPIPE _____
PUMP ON: date _____ time _____
PUMP OFF: date _____ time _____
DURATION OF AQUIFER TEST _____

LOCATION Kearney Flats Plant, Gordon, CO
PERSONNEL W. Harst D. Harst - K. Harst

PROJECT 106P06 222

| TIME | | | | WATER LEVEL DATA | | | | DISCHARGE | | RECORDED BY | COMMENTS |
|-------------------------|------------|-------|------|---------------------------------|------------------------|-------------|---------|-----------|---|-------------|------------------------|
| t = <u>12</u> at t' = 0 | | | | STATIC WATER LEVEL <u>10.18</u> | | | | | | | |
| DAY | CLOCK TIME | t | t' | READING | CONVERSION CORRECTIONS | WATER LEVEL | s or s' | READING | Q | | |
| 2 | 13:00:00 | 1666 | 1654 | 30+4.69 | 2.08 | 32.61 | -22.43 | | | JP | |
| | 13:55:00 | 1721 | 1709 | 30+4.40 | " | 32.32 | -22.14 | | | JP | |
| | 15:00:00 | 1786 | 1774 | 30+4.08 | " | 32.00 | -21.82 | | | JP | |
| 2 | 16:00:00 | 1846 | 1834 | 30+3.75 | " | 31.67 | -21.49 | | | JP | |
| 4 | 08:11 | 4257 | 4245 | 30+3.80 | " | 31.72 | -11.54 | | | WTH | |
| 4 | 17:23 | 4809 | 4797 | 30+2.14 | " | 20.06 | -9.88 | | | WTH | |
| 5 | 09:10 | 5756 | 5744 | 15+4.58 | " | 17.50 | -7.32 | | | WTH | 90% = 13.67 ft |
| 5 | 16:10 | 6176 | 6164 | 15+3.73 | " | 17.65 | -6.47 | | | JP | |
| 6 | 08:30 | 7116 | 7104 | 15+1.78 | " | 14.70 | -4.52 | | | | |
| 6 | 15:45 | 7551 | 7539 | 15+0.91 | " | 13.83 | -3.65 | | | JP | |
| 7 | 08:25 | 8491 | 8479 | 10+4.39 | " | 12.31 | -2.13 | | | JP | |
| 7 | 17:50 | 8756 | 8744 | 10+3.70 | " | 11.62 | -1.44 | | | JP | |
| 2 | 09:45 | 10011 | 9999 | 10+2.58 | " | 10.50 | -0.32 | | | JP | 90%+ Recovery attained |

PACKER TEST ANALYSIS

WELL NO. 16-86

ROCKY FLATS PLANT JOB NO. 106P06222

DATE TESTED: 8/27/86 BY: T. GULLIVER

TEST INTERVAL (FEET BELOW G.S.): 28.68 - 38.68

MATERIAL TESTED: ARAPAHOE CLAYSTONE

DEPTH TO WATER (FEET BELOW G.S.): 5.09

$$K = \frac{Q}{2(\pi)(L)(H)} \ln\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00147231 (FEET³/MIN)

L = LENGTH OF TEST INTERVAL = 10.00 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 5.09 + 1.32 + 2.70 * 2.31 = 12.65

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000766 FT/MIN

K = .00000389 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00332177 (FEET³/MIN)

L = LENGTH OF TEST INTERVAL = 10.00 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 5.09 + 1.32 + 4.00 * 2.31 = 15.65

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00001397 FT/MIN

K = .00000710 CM/SEC

2ND P1/3 TEST

TEST ABORTED

PACKER TEST ANALYSIS
 WELL NO. 16-86
 ROCKY FLATS PLANT JOB NO. 106P06222
 DATE TESTED: 8/27/86 BY: T. GULLIVER
 TEST INTERVAL (FEET BELOW G.S.): 34.43 - 44.42
 MATERIAL TESTED: ARAPAHOE CLAYSTONE
 DEPTH TO WATER (FEET BELOW G.S.): 5.09

$$K = \frac{Q}{2(\pi)(L)(H)} \ln\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00057539 (FEET³/MIN)
 L = LENGTH OF TEST INTERVAL = 9.99 FEET
 TEST INTERVAL IS BELOW WATER TABLE
 HEAD = DEPTH TO WATER + GAGE HEIGHT
 + GAGE PRESSURE (IN FEET)
 = 5.09 + 1.32 + 2.80 * 2.31 = 12.88
 R = BOREHOLE RADIUS = .16 FEET

 K = HYDRAULIC CONDUCTIVITY = .00000294 FT/MIN
 K = .00000149 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00089354 (FEET³/MIN)
 L = LENGTH OF TEST INTERVAL = 9.99 FEET
 TEST INTERVAL IS BELOW WATER TABLE
 HEAD = DEPTH TO WATER + GAGE HEIGHT
 + GAGE PRESSURE (IN FEET)
 = 5.09 + 1.32 + 7.80 * 2.31 = 24.43
 R = BOREHOLE RADIUS = .16 FEET

 K = HYDRAULIC CONDUCTIVITY = .00000241 FT/MIN
 K = .00000122 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00093416 (FEET³/MIN)
 L = LENGTH OF TEST INTERVAL = 9.99 FEET
 TEST INTERVAL IS BELOW WATER TABLE
 HEAD = DEPTH TO WATER + GAGE HEIGHT
 + GAGE PRESSURE (IN FEET)
 = 5.09 + 1.32 + 2.53 * 2.31 = 12.25
 R = BOREHOLE RADIUS = .16 FEET

 K = HYDRAULIC CONDUCTIVITY = .00000502 FT/MIN
 K = .00000255 CM/SEC

PACKER TEST ANALYSIS
WELL NO. 16-86
ROCKY FLATS PLANT JOB NO. 106P06222
DATE TESTED: 8/27/86 BY: T. GULLIVER
TEST INTERVAL (FEET BELOW G.S.): 42.59 - 52.59
MATERIAL TESTED: ARAPAHOE CLAYSTONE
DEPTH TO WATER (FEET BELOW G.S.): 5.09

$$K = \frac{Q}{2(\pi)(L)(H)} \ln\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00002031 (FEET³/MIN)
L = LENGTH OF TEST INTERVAL = 10.00 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 5.09 + 1.32 + 3.80 * 2.31 = 15.19
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000009 FT/MIN
K = .00000004 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00114462 (FEET³/MIN)
L = LENGTH OF TEST INTERVAL = 10.00 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 5.09 + 1.32 + 10.00 * 2.31 = 29.51
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000255 FT/MIN
K = .00000130 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00027077 (FEET³/MIN)
L = LENGTH OF TEST INTERVAL = 10.00 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 5.09 + 1.32 + 2.70 * 2.31 = 12.65
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000141 FT/MIN
K = .00000072 CM/SEC

PACKER TEST ANALYSIS
WELL NO. 16-86
ROCKY FLATS PLANT JOB NO. 106P06222
DATE TESTED: 8/27/86 BY: T. GULLIVER
TEST INTERVAL (FEET BELOW G.S.): 52.43 - 62.43
MATERIAL TESTED: ARAPAHOE SILTSTONE
DEPTH TO WATER (FEET BELOW G.S.): 5.09

$$K = \frac{Q}{2(\pi)(L)(H)} \ln\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00009269 (FEET³/MIN)
L = LENGTH OF TEST INTERVAL = 10.00 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 5.09 + 1.32 + 3.80 * 2.31 = 15.19
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000040 FT/MIN
K = .00000020 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00230638 (FEET³/MIN)
L = LENGTH OF TEST INTERVAL = 10.00 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 5.09 + 1.32 + 15.00 * 2.31 = 41.06
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000370 FT/MIN
K = .00000188 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00014215 (FEET³/MIN)
L = LENGTH OF TEST INTERVAL = 10.00 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 5.09 + 1.32 + 4.00 * 2.31 = 15.65
R = BOREHOLE RADIUS = .16 FEET

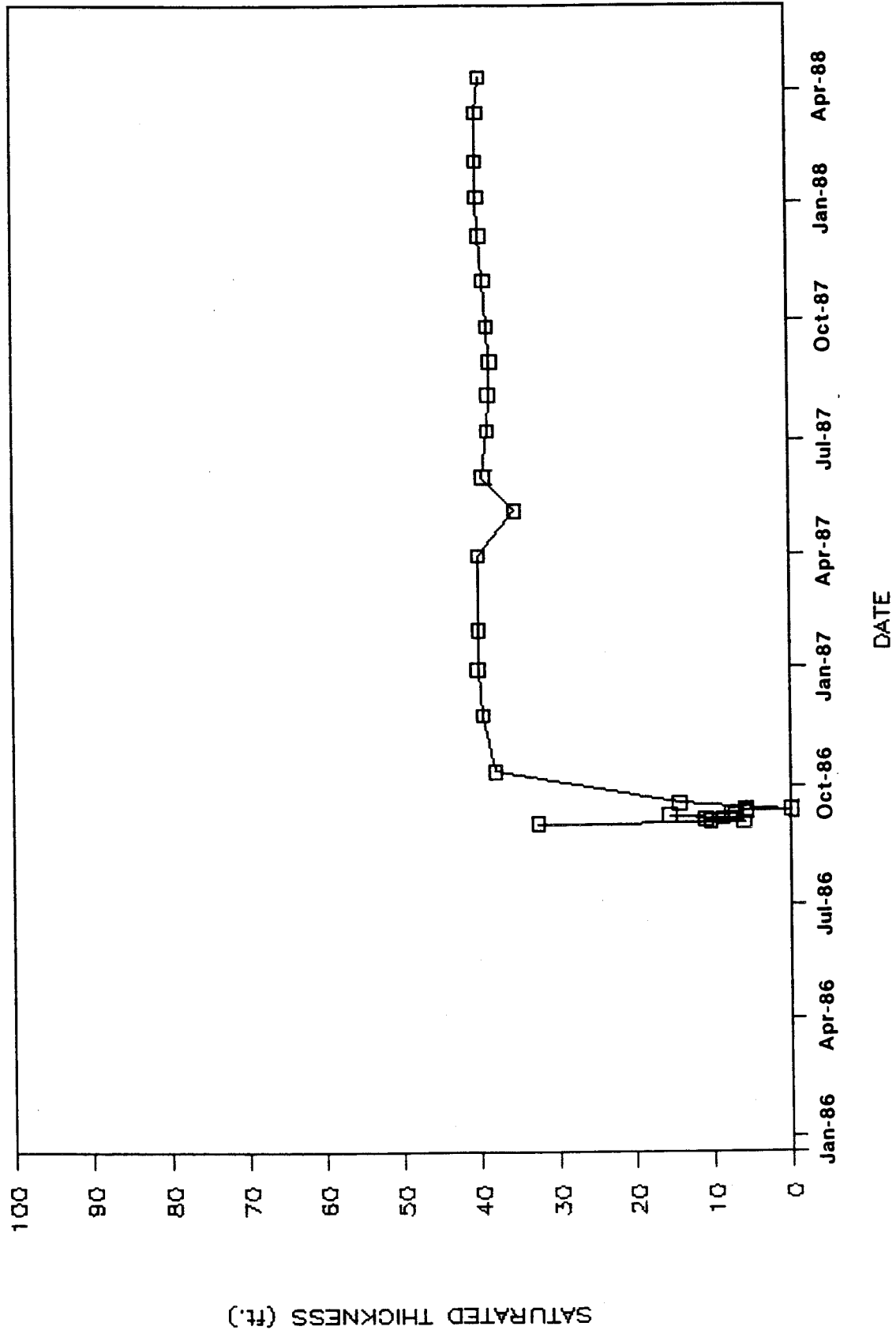
K = HYDRAULIC CONDUCTIVITY = .00000060 FT/MIN
K = .00000030 CM/SEC

ROCKY FLATS SOLAR PONDS

WATER LEVEL SUMMARY

| WELL NUMBER | DATE | GROUND SURFACE ELEVATION | TOP OF CASING ELEVATION | STICK UP | DEPTH OF SI BASE | WATER DEPTH BELOW TOC | WATER SURFACE ELEVATION |
|----------------|----------|--------------------------------|-------------------------------|-------------|------------------------|-----------------------------|-------------------------------|
| 1686 | 09/02/86 | 5864.74 | 5866.60 | 1.86 | 45.06 | 12.66 | 5853.94 |
| | 09/03/86 | | | | | 38.94 | 5827.66 |
| | 09/04/86 | | | | | 34.75 | 5831.85 |
| | 09/05/86 | | | | | 34.04 | 5832.56 |
| | 09/06/86 | | | | | 36.26 | 5830.34 |
| | 09/08/86 | | | | | 29.50 | 5837.10 |
| | 09/09/86 | | | | | 37.92 | 5828.68 |
| | 09/10/86 | | | | | 37.80 | 5828.80 |
| | 09/11/86 | | | | | 37.34 | 5829.26 |
| | 09/12/86 | | | | | 39.14 | 5827.46 |
| | 09/13/86 | | | | | 39.23 | 5827.37 |
| | 09/13/86 | | | | | 45.35 | 5821.25 |
| | 09/18/86 | | | | | 30.71 | 5835.89 |
| | 10/13/86 | | | | | 7.19 | 5859.41 |
| | 11/26/86 | | | | | 5.68 | 5860.92 |
| | 01/01/87 | | | | | 5.04 | 5861.56 |
| | 02/01/87 | | | | | 5.15 | 5861.45 |
| | 04/01/87 | | | | | 5.10 | 5861.50 |
| | 05/06/87 | | | | | 9.79 | 5856.81 |
| | 06/01/87 | | | | | 5.81 | 5860.79 |
| | 07/08/87 | | | | | 6.40 | 5860.20 |
| | 08/06/87 | | | | | 6.60 | 5860.00 |
| | 09/01/87 | | | | | 6.80 | 5859.80 |
| | 09/28/87 | | | | | 6.40 | 5860.20 |
| | 11/03/87 | | | | | 6.00 | 5860.60 |
| | 12/08/87 | | | | | 5.50 | 5861.10 |
| | 01/07/88 | | | | | 5.30 | 5861.30 |
| | 02/04/88 | | | | | 5.20 | 5861.40 |
| | 03/14/88 | | | | | 5.30 | 5861.30 |
| | 04/11/88 | | | | | 5.60 | 5861.00 |

SATURATED THICKNESS IN WELL # 16-86(SP)



INDEX OF DATA

Boring No.: 17-86

Completed as well? Yes

Data in File

- X Log of Borehole
- X Well Construction Summaries
- Well Development Summaries
- X Hydraulic Conductivity Test Data
and Results
- Packer Test Data and Results
- X Water Level Data
- X Saturated Thickness Hydrographs

Project: Rocky Flats Plant

LOG OF BORING NO. 17-86

Date Drilled 8/14/86

Coordinates N 38752.3 E 22141.7

Boring Method Hollow Stem Auger

Ground Surface Elevation 5865.26

| Elev. (feet) | Depth (feet) | Sample Type | Graphic Log | Material Description | Penetration Resistance (Blows/inch) | | Water Content (%) | | Other Tests |
|-----------------|-----------------|----------------|----------------|---|---|----|-------------------------|----|----------------|
| | | | | | 20 | 40 | 20 | 40 | |
| | 0 | | | VALLEY FILL ALLUVIUM | | | | | |
| | | | | 0-0.5'-Sample. Recovered 0.5/0.5'=100%. CLAY: grayish orange (10YR 7/4); silty and sandy; trace granitic pebbles (subangular); poorly sorted; unconsolidated; dry. | | | | | |
| | | | | 0.5-5.0'-Sample. Recovered 3.5/4.5'=88%. GRAVEL: dusky yellowish brown (10YR 2/2); granitic pebbles and cobbles interbedded with silty clay stringers; approximately 3% iron staining in gravel stringers; poorly sorted; unconsolidated; damp. | | | | | |
| | 5 | | | 5.0-8.0'-Sample. Recovered 3.0/3.0'=100%. GRAVEL: dark yellowish brown (10YR 4/2); interbedded granitic pebbles, sand, silt and clay; poorly sorted; subangular; wet. | | | | | |
| | | | | 8.0-13.0'-Sample. Recovered 2.0/5.0'=40%. 8.0-12.5'. GRAVEL: dark yellowish brown (10YR 4/2) and dark yellowish orange (10YR 6/6) granitic pebbles and cobbles; sandy and silty; poorly sorted; unconsolidated; wet. | | | | | |
| | 10 | | | ARAPAHOE FORMATION | | | | | |
| | | | | 12.5-13.0'. CLAYSTONE. | | | | | |
| | | | | 13.0-16.0'-Sample. Recovered 2.8/3.0'=93%. CLAYSTONE: Dusky yellowish brown (10YR 2/2) and dark yellowish orange (10YR 6/6); silty; consolidated; weathered; moist. | | | | | |
| | 15 | | | 16.0-19.2'- Sample. Recovered 1.8/3.2'=56%. CLAYSTONE: dark yellowish brown (10YR 4/2); 10% iron staining; consolidated; moist. | | | | | |
| | 20 | | | TOTAL DEPTH: 19.2' | | | | | |

Remarks

Logged by: L. Pivonka

Checked by: *[Signature]*Project No.
106P06222

Hydro-Search, Inc.

Page 1 of 1

WELL CONSTRUCTION SUMMARY

LOCATION or COORDS: _____
N 38752.3 E 22141.7

ELEVATION: GROUND LEVEL 5865.26'
TOP OF CASING 5866.55'

DRILLING SUMMARY:

TOTAL DEPTH Well: 13.98' Hole: 19.20'

BOREHOLE DIAMETER 7 1/4"

DRILLER Boyles Brothers Drilling Co.

15865 W. 5th Avenue

Golden, CO (Jim Horn)

RIG Mobile B-57

BIT(S) Bull nose bit

DRILLING FLUID None

SURFACE CASING 5" x 5' steel w/ locking cap

WELL DESIGN:

BASIS: GEOLOGIC LOG X GEOPHYSICAL LOG

CASING STRING(S): C=CASING S=SCREEN

0.00' 3.73' Cl

3.73' - 13.98' SI

CASING: C1 2" I.D. Sch. 5 type 316 stain-
less steel threaded and flush
jointed.

SCREEN: SI 2" I.D. Sch. 5 type 316 stain-
less steel, threaded and flush
jointed, 0.010" wire wrapped
screen, 0.25' welded bottom cap.

CENTRALIZERS Type 304 stainless steel
7.97' - 9.09'

FILTER MATERIAL 10-20 silica sand
2.50' - 14.00'

CEMENT Portland Type I
0.00' - 2.00'

OTHER 3/8" bentonite pellets
2.00' - 2.50'

14.00' - 15.25'

CONSTRUCTION TIME LOG:

| <u>TASK</u> | <u>START</u> | | <u>FINISH</u> | |
|--------------|--------------|-------------|---------------|-------------|
| | <u>DATE</u> | <u>TIME</u> | <u>DATE</u> | <u>TIME</u> |
| DRILLING: | 1986 | | 1986 | |
| 7 1/2" auger | 8/14 | 0931 | 8/18 | 1020 |

GEOPHYS. LOGGING:

| | | | | |
|--------------|------|------|------|------|
| CASING: | | | | |
| 2" stainless | 8/15 | 1037 | 8/15 | 1040 |

| | | | | |
|-------------------|-------------|-------------|-------------|-------------|
| FILTER PLACEMENT: | <u>8/15</u> | <u>1040</u> | <u>8/15</u> | <u>1056</u> |
|-------------------|-------------|-------------|-------------|-------------|

| | | | | |
|------------|-------------|-------------|-------------|-------------|
| CEMENTING: | <u>8/15</u> | <u>1100</u> | <u>8/15</u> | <u>1110</u> |
|------------|-------------|-------------|-------------|-------------|

| | | | | |
|--------------|------------|-------------|-------------|-------------|
| DEVELOPMENT: | <u>9/2</u> | <u>1550</u> | <u>9/22</u> | <u>0920</u> |
|--------------|------------|-------------|-------------|-------------|

| | | | | |
|--------|--|--|--|--|
| OTHER: | | | | |
|--------|--|--|--|--|

| | | | | |
|------------------|-------------|-------------|-------------|-------------|
| <u>Bentonite</u> | <u>8/15</u> | <u>1058</u> | <u>8/15</u> | <u>1100</u> |
|------------------|-------------|-------------|-------------|-------------|

| | | | | |
|--|------|------|------|------|
| | 8/15 | 1025 | 8/15 | 1040 |
|--|------|------|------|------|

WELL DEVELOPMENT

See Well Development Summary Sheet.

COMMENTS:

Water encountered at 4.8' during drilling.

Top of stainless steel casing: 1.29'

Cave from TD to 15.25'



SHEET _____ of _____

CLIENT/SUBJECT _____ W.O. NO. _____

TASK DESCRIPTION _____ TASK NO. _____

PREPARED BY _____ DEPT _____ DATE _____

MATH CHECK BY _____ DEPT _____ DATE _____

METHOD REV. BY _____ DEPT _____ DATE _____

APPROVED BY

DEPT _____ DATE _____

WELL 17-86

Hydraulic Conductivity (cm/sec) = 4.8×10^{-6}

Static Water Level (ft below G.L.) = 4.63'

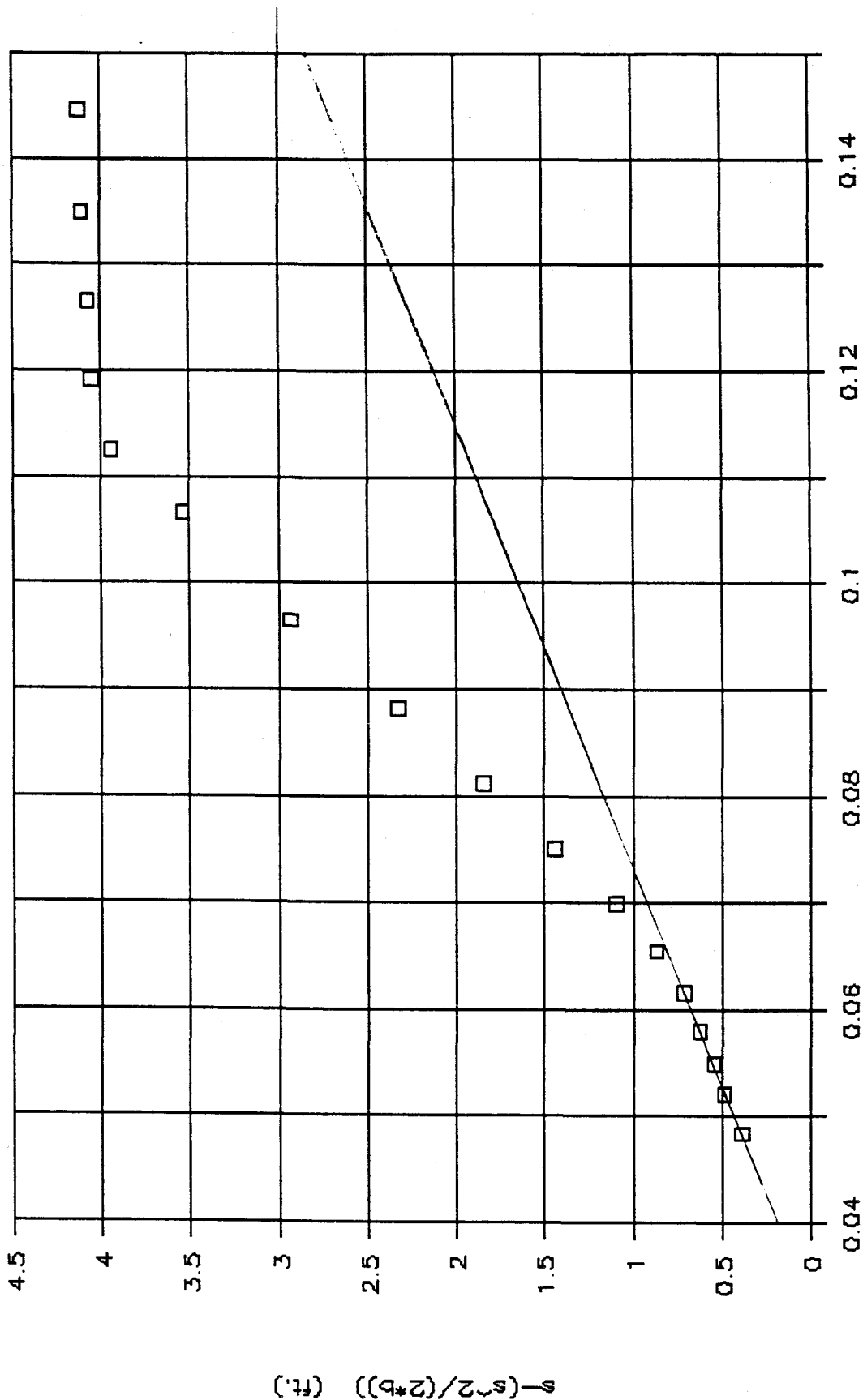
Screened Interval (ft below G.L.) = 3.73 - 13.98'

3.73 - 12.5' gravel

12.5 - 13.98' claystone

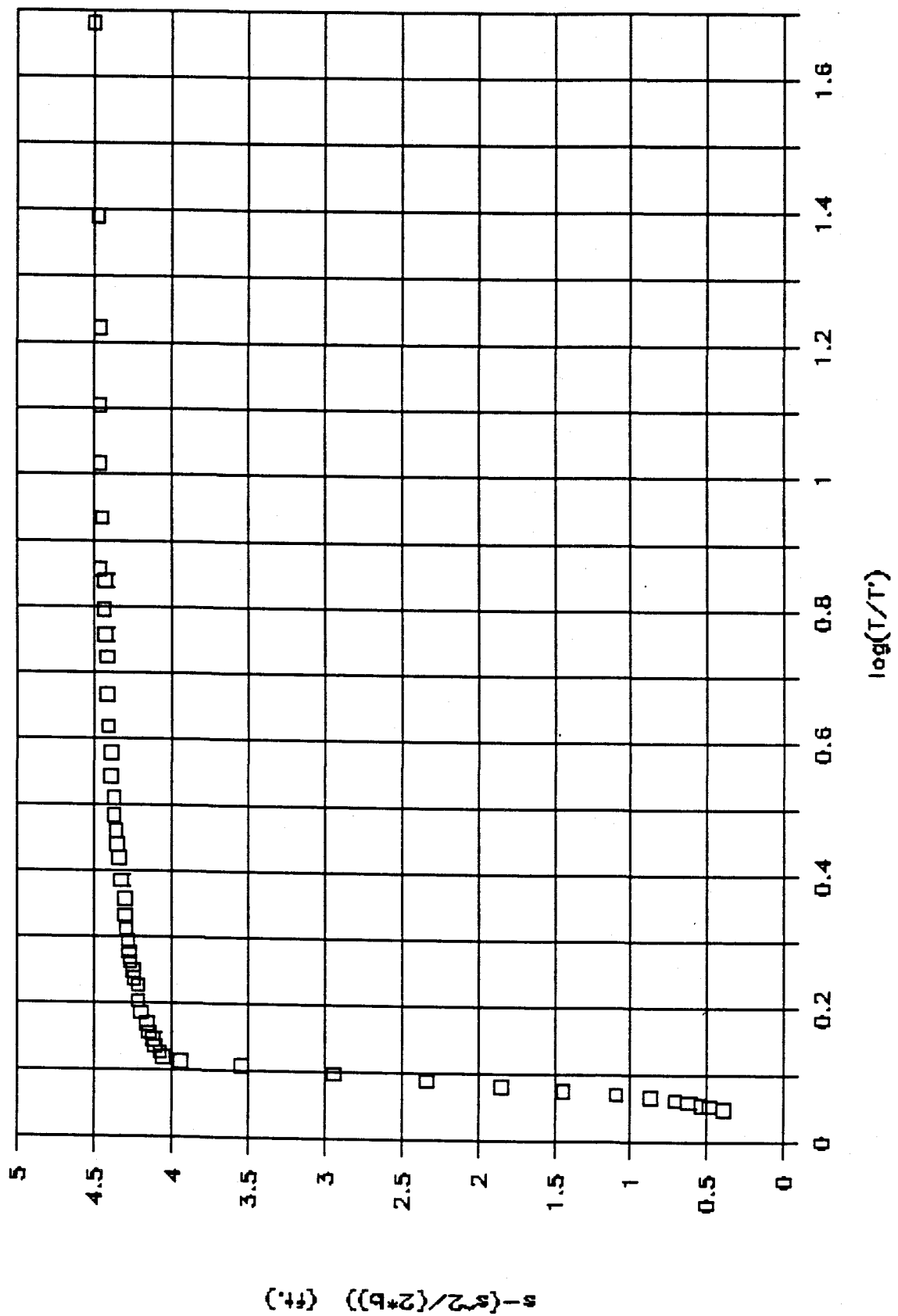
Method of Analysis: (Bouwer, 1978)

WELL 15-86

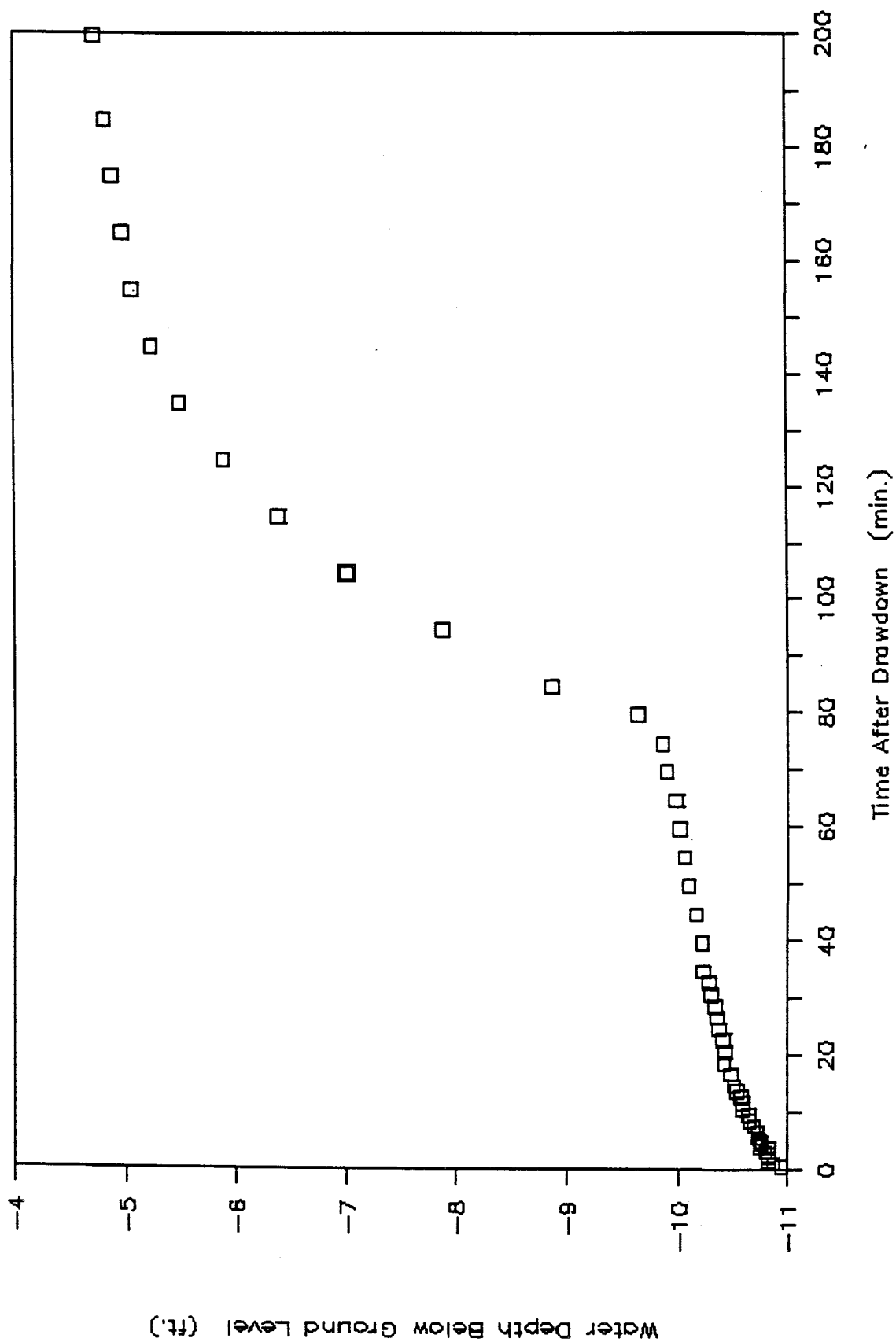


$$\log(T/T') \quad \Delta s' = \frac{2.84 - 0.20}{0.15 - 0.04} = 24' / \log \text{ cycle}$$

WELL 15-86



WELL 15-86



| WELL 15-86 | | | | | |
|------------|---------|-------|----------|-------------|-----------|
| T | T' | Water | s' | s-(s^2/2b) | log(T/T') |
| Time | T Prime | Level | Rsd Drwn | b=10.36 ft. | |
| (min.) | (min.) | (ft.) | (ft.) | (ft.) | |
| 24.00 | 0.50 | 10.94 | 6.61 | 4.50 | 1.68 |
| 24.50 | 1.00 | 10.87 | 6.54 | 4.48 | 1.39 |
| 25.00 | 1.50 | 10.82 | 6.49 | 4.46 | 1.22 |
| 25.50 | 2.00 | 10.82 | 6.49 | 4.46 | 1.11 |
| 26.00 | 2.50 | 10.82 | 6.49 | 4.46 | 1.02 |
| 26.60 | 3.10 | 10.80 | 6.47 | 4.45 | 0.93 |
| 27.30 | 3.80 | 10.82 | 6.49 | 4.46 | 0.86 |
| 27.50 | 4.00 | 10.75 | 6.42 | 4.43 | 0.84 |
| 28.00 | 4.50 | 10.76 | 6.43 | 4.43 | 0.79 |
| 28.50 | 5.00 | 10.74 | 6.41 | 4.43 | 0.76 |
| 29.00 | 5.50 | 10.72 | 6.39 | 4.42 | 0.72 |
| 30.00 | 6.50 | 10.72 | 6.39 | 4.42 | 0.66 |
| 31.00 | 7.50 | 10.69 | 6.36 | 4.41 | 0.62 |
| 32.00 | 8.50 | 10.65 | 6.32 | 4.39 | 0.58 |
| 33.00 | 9.50 | 10.64 | 6.31 | 4.39 | 0.54 |
| 34.00 | 10.50 | 10.59 | 6.26 | 4.37 | 0.51 |
| 35.00 | 11.50 | 10.59 | 6.26 | 4.37 | 0.48 |
| 36.00 | 12.50 | 10.57 | 6.24 | 4.36 | 0.46 |
| 37.00 | 13.50 | 10.54 | 6.21 | 4.35 | 0.44 |
| 38.00 | 14.50 | 10.51 | 6.18 | 4.34 | 0.42 |
| 40.00 | 16.50 | 10.48 | 6.15 | 4.32 | 0.38 |
| 42.00 | 18.50 | 10.42 | 6.09 | 4.30 | 0.36 |
| 44.00 | 20.50 | 10.43 | 6.10 | 4.30 | 0.33 |
| 46.00 | 22.50 | 10.41 | 6.08 | 4.30 | 0.31 |
| 48.00 | 24.50 | 10.37 | 6.04 | 4.28 | 0.29 |
| 50.00 | 26.50 | 10.36 | 6.03 | 4.28 | 0.28 |
| 52.00 | 28.50 | 10.34 | 6.01 | 4.27 | 0.26 |
| 54.00 | 30.50 | 10.30 | 5.97 | 4.25 | 0.25 |
| 56.00 | 32.50 | 10.28 | 5.95 | 4.24 | 0.24 |
| 58.00 | 34.50 | 10.23 | 5.90 | 4.22 | 0.23 |
| 63.00 | 39.50 | 10.22 | 5.89 | 4.22 | 0.20 |
| 68.00 | 44.50 | 10.17 | 5.84 | 4.19 | 0.18 |
| 73.00 | 49.50 | 10.09 | 5.76 | 4.16 | 0.17 |
| 78.00 | 54.50 | 10.06 | 5.73 | 4.15 | 0.16 |
| 83.00 | 59.50 | 10.01 | 5.68 | 4.12 | 0.14 |
| 88.00 | 64.50 | 9.98 | 5.65 | 4.11 | 0.13 |
| 93.00 | 69.50 | 9.90 | 5.57 | 4.07 | 0.13 |
| 98.00 | 74.50 | 9.86 | 5.53 | 4.05 | 0.12 |
| 103.00 | 79.50 | 9.63 | 5.30 | 3.94 | 0.11 |
| 108.00 | 84.50 | 8.86 | 4.53 | 3.54 | 0.11 |
| 118.00 | 94.50 | 7.87 | 3.54 | 2.94 | 0.10 |
| 128.00 | 104.50 | 7.01 | 2.68 | 2.33 | 0.09 |
| 138.00 | 114.50 | 6.38 | 2.05 | 1.85 | 0.08 |

| WELL 15-86 | | | | | |
|------------|---------|-------|----------|------------------------|-----------|
| T | T' | Water | s' | s-(s ² /2b) | log(T/T') |
| Time | T Prime | Level | Rsd Drwn | b=10.36 ft. | |
| (min.) | (min.) | (ft.) | (ft.) | (ft.) | |
| 148.00 | 124.50 | 5.89 | 1.56 | 1.44 | 0.08 |
| 158.00 | 134.50 | 5.49 | 1.16 | 1.10 | 0.07 |
| 168.00 | 144.50 | 5.24 | 0.91 | 0.87 | 0.07 |
| 178.00 | 154.50 | 5.07 | 0.74 | 0.71 | 0.06 |
| 188.00 | 164.50 | 4.98 | 0.65 | 0.63 | 0.06 |
| 198.00 | 174.50 | 4.89 | 0.56 | 0.54 | 0.05 |
| 208.00 | 184.50 | 4.83 | 0.50 | 0.49 | 0.05 |
| 223.00 | 199.50 | 4.73 | 0.40 | 0.39 | 0.05 |

AQUIFER TEST DATA

WELL 15-26

PUMPING or OBSERVATION WELL

PUMPING or RECOVERY DATA

PAGE 1 OF

TYPE OF AQUIFER TEST Constant Discharge

HOW Q MEASURED 2 gallon bucket

HOW W.L.'s MEASURED Olympic well sounder

RAD./DIST. OF FROM PUMPING WELL 0

MEAS. POINT FOR W.L.'s N. side of 2" PVC

ELEVATION OF MEAS. POINT

DEPTH OF PUMP/AIRPIPE

PUMP ON: date 9/26/86 time 1512

PUMP OFF: date 9/26/86 time

DURATION OF AQUIFER TEST

| TIME | | | | WATER LEVEL DATA | | | | DISCHARGE | | RECORDED BY | COMMENTS |
|---------------------|------------|----------|----|------------------------------------|------------------------|-------------|---------|-----------|----------|-------------|---------------------|
| t = _____ at t' = 0 | | | | STATIC WATER LEVEL <u>4.33 ft.</u> | | | | | | | |
| DAY | CLOCK TIME | t | t' | READING | CONVERSION CORRECTIONS | WATER LEVEL | s or s' | READING | Q | | |
| 1 | 1336 | original | | 5+2.12 | 2.78 | 4.34 | N/A | | | | T.D. = 14.15 |
| | 1512 | 0 | | 5+3.47 | 1.33+2.78 | 4.33 | 0 | | | | W.L. = 4.34 |
| | 1512:30 | 0.5 | | 5+4.19 | 1.33+2.78 | 5.08 | 1.75 | | | | Note: T.D. & |
| | 1513:00 | 1 | | 10-0.05 | " | 5.84 | 1.51 | | | | W.L. taken |
| | 1513:30 | 1.5 | | 10+0.61 | " | 6.50 | 2.17 | | | | before PVC pipe |
| | 1514:00 | 2 | | 10+1.27 | " | 7.16 | 2.83 | | | | inserted down- |
| | 1514:30 | 2.5 | | 10+1.93 | " | 7.82 | 3.49 | | | | hole. |
| | 1515:00 | 3 | | 10+2.57 | " | 8.46 | 4.13 | | | | |
| | 1515:30 | 3.5 | | 10+3.07 | " | 8.96 | 4.63 | | | | |
| | 1516:00 | 4 | | 10+3.57 | " | 9.46 | 5.13 | | | | |
| | 1516:30 | 4.5 | | | | | | 4 | 0.93 gpm | | 4 gal |
| | 1517:00 | 5 | | 10+4.21 | | 10.10 | 5.77 | | | | |
| | 1517:30 | 5.5 | | 10+4.23 | | 10.12 | 5.79 | | | | 1.33 = PVC incl. |
| | 1518:00 | 6 | | 10+4.12 | | 10.01 | 5.68 | | | | 2.78 = inner casing |
| | 1518:30 | 6.5 | | 10+4.21 | " | 10.10 | 5.77 | | | | check-up |
| | 1519:00 | 7 | | 10+4.26 | " | 10.15 | 5.82 | | | | |
| | 1519:30 | 7.5 | | 10+4.28 | " | 10.17 | 5.84 | | | | |
| | 1520:00 | 8 | | 10+4.28 | " | 10.17 | 5.84 | | | | |
| | 1521:00 | 9 | | 10+4.41 | " | 10.30 | 5.97 | 4 | 0.85 gpm | | 4 gal |
| | 1522:00 | 10 | | 10+4.43 | " | 10.32 | 5.99 | | | | |
| | 1523:00 | 11 | | 10+4.49 | " | 10.38 | 6.05 | | | | |
| | 1524:00 | 12 | | 10+4.51 | " | 10.40 | 6.07 | | | | |
| | 1525:00 | 13 | | 10+4.54 | " | 10.43 | 6.10 | 15:25:30 | 4 | 0.88 gpm | |
| | 1526:00 | 14 | | 10+4.62 | " | 10.51 | 6.18 | | | | |
| | 1527:00 | 15 | | 10+4.73 | " | 10.64 | 6.31 | | | | |
| | 1528:00 | 16 | | 10+4.79 | " | 10.68 | 6.35 | | | | |
| | 1529:00 | 17 | | 10+4.89 | " | 10.78 | 6.45 | 10:29:30 | 4 | 1 gpm | |
| | 1530:00 | 18 | | 10+4.98 | " | 10.87 | 6.54 | | | | (15:35:17, 4.5 gal |
| | 1532:00 | 20 | | 15+0.16 | " | 11.05 | 6.72 | | | | + W.L. @ 15+0.5; |
| | 1534:00 | 22 | | 15+0.28 | " | 11.17 | 6.84 | | | | Pump off @ |
| | 1535:17 | 23 | | 15+0.53 | " | 11.42 | 7.09 | 15:35:17 | 4.5 | 0.83 gpm | 15:35:30, Next |
| | 1536:00 | 24 | | 15+0.05 | " | 10.94 | -6.61 | | | | reading at 15:30 |
| | 1536:30 | 24.5 | | 10+4.98 | " | 10.87 | -6.54 | | | | begin recharge |
| | 1537:00 | 25 | | 10+4.93 | " | 10.82 | -6.49 | | | | |
| | 1537:30 | 25.5 | | 10+4.93 | " | 10.82 | -6.49 | | | | |
| | 1538:00 | 26 | | 10+4.93 | " | 10.82 | -6.49 | | | | |
| | 1538:30 | 26.5 | | 10+4.91 | " | 10.80 | -6.47 | | | | |
| | 1539:00 | 27 | | 10+4.93 | " | 10.82 | -6.49 | | | | |
| | 1539:30 | 27.5 | | 10+4.96 | " | 10.75 | -6.42 | | | | |
| | 1540:00 | 28 | | 10+4.87 | " | 10.76 | -6.43 | | | | |
| | 1540:30 | 28.5 | | 10+4.85 | " | 10.74 | -6.41 | | | | |

HYDRO-SEARCH

RENO • DENVER

CONSULTING HYDROLOGISTS-GEOLOGISTS

AQUIFER TEST DATA

TYPE OF AQUIFER TEST Constant Discharge
 HOW Q MEASURED 4 1/2 gallon bucket
 HOW W.L.'s MEASURED OLYMPIC WELL SOUNDER
 RAD./DIST. OF/FROM PUMPING WELL 0
 MEAS. POINT FOR W.L.'s N. side of 1/2" PVC
 ELEVATION OF MEAS. POINT _____

WELL 15-26
 PUMPING or OBSERVATION WELL
 PUMPING or RECOVERY DATA
 PAGE 2 OF _____

DEPTH OF PUMP/AIRPIPE _____
 PUMP ON: date _____ time _____
 PUMP OFF: date _____ time _____
 DURATION OF AQUIFER TEST _____

LOCATION F. Barber Zone
 PERSONNEL W. Hest D. Parlick

PROJECT Rocky Flats
106 P06-2-2

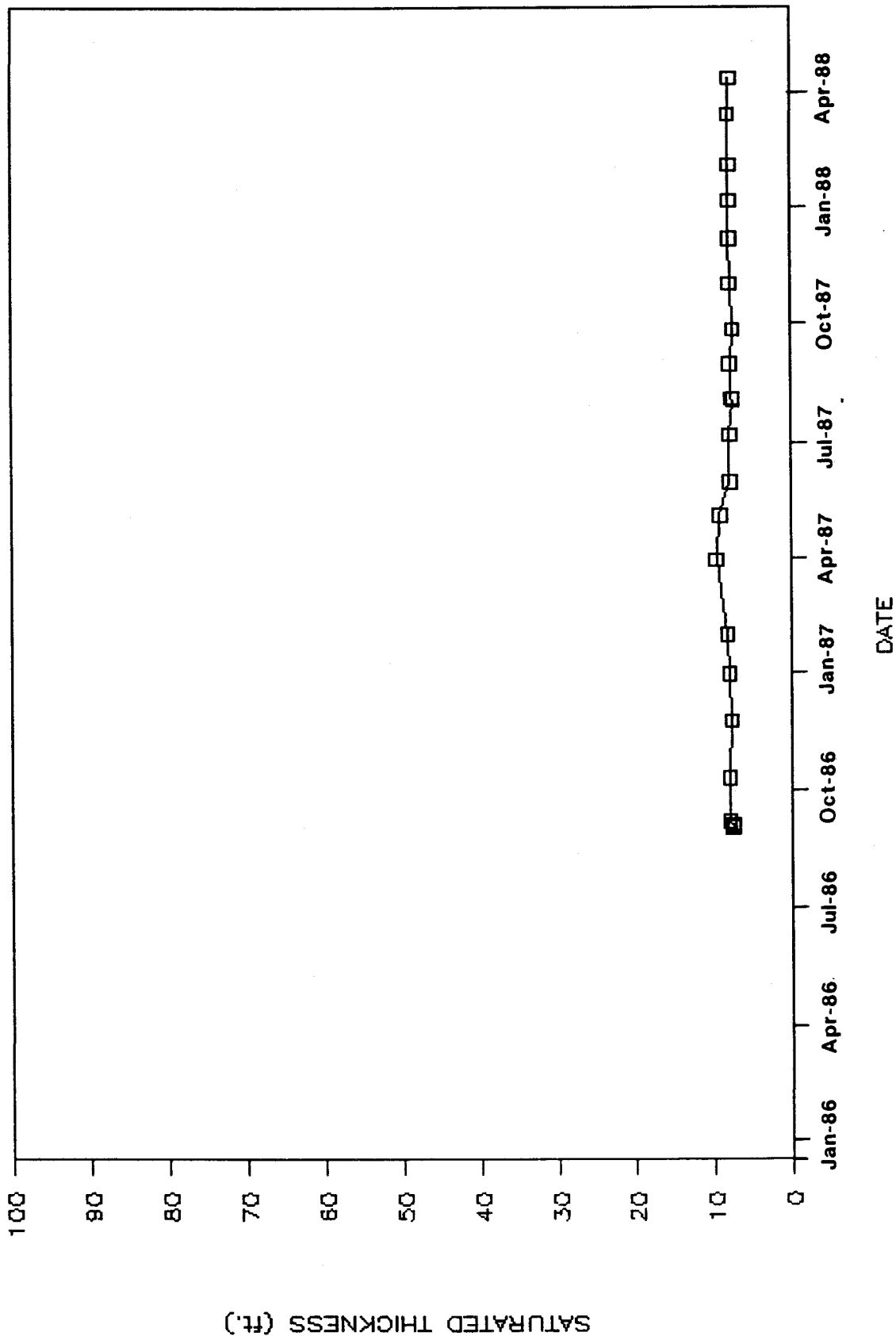
| TIME | | | | WATER LEVEL DATA | | | | | DISCHARGE | | RECORDED BY | COMMENTS |
|---------------------|------------|------|-----|--------------------------|------------------------|-------------|---------|--|-----------|---|-------------|----------------------|
| t = _____ at t' = 0 | | | | STATIC WATER LEVEL _____ | | | | | | | | |
| DAY | CLOCK TIME | t | t' | READING | CONVERSION CORRECTIONS | WATER LEVEL | s or s' | | READING | Q | | |
| 15 | 41:00 | 29 | 5 | 10+4.83 | 1.32+2.78 | 10.72 | -6.39 | | | | WH | |
| 15 | 42:00 | 30 | 6 | 10+4.83 | 1.33+2.78 | 10.72 | -6.39 | | | | | |
| 15 | 43:00 | 31 | 7 | 10+4.80 | " | 10.69 | -6.36 | | | | | |
| 15 | 44:00 | 32 | 8 | 10+4.76 | " | 10.65 | -6.32 | | | | | |
| 15 | 45:00 | 33 | 9 | 10+4.75 | " | 10.64 | -6.31 | | | | ↓ | 90% recovered 2.5 ft |
| 15 | 46 | 34 | 10 | 10+4.70 | " | 10.59 | -6.26 | | | | DP | |
| 15 | 47 | 35 | 11 | 10+4.70 | " | 10.59 | -6.26 | | | | | |
| 15 | 48 | 36 | 12 | 10+4.68 | " | 10.57 | -6.24 | | | | | |
| 15 | 49 | 37 | 13 | 10+4.65 | " | 10.54 | -6.21 | | | | | |
| 15 | 50 | 38 | 14 | 10+4.62 | " | 10.51 | -6.18 | | | | | |
| 15 | 52 | 40 | 16 | 10+4.59 | " | 10.48 | -6.15 | | | | | |
| | 554 | 42 | 18 | 10+4.53 | " | 10.42 | -6.09 | | | | ↓ | |
| | 556 | 44 | 20 | 10+4.54 | " | 10.43 | -6.10 | | | | | |
| | 558 | 46 | 22 | 10+4.52 | " | 10.41 | -6.08 | | | | DP | |
| | 1600 | 48 | 24 | 10+4.48 | " | 10.37 | -6.04 | | | | WH | |
| | 1602 | 50 | 26 | 10+4.47 | " | 10.36 | -6.03 | | | | WH | |
| | 1604 | 52 | 28 | 10+4.45 | " | 10.34 | -6.01 | | | | DP | |
| | 1606 | 54 | 30 | 10+4.41 | " | 10.30 | -5.97 | | | | WH | |
| | 1608 | 56 | 32 | 10+4.39 | " | 10.28 | -5.95 | | | | WH | |
| | 1610 | 58 | 34 | 10+4.34 | " | 10.23 | -5.90 | | | | DP | |
| | 1615 | 1:03 | 39 | 10+4.33 | " | 10.22 | -5.89 | | | | ↓ | |
| | 1620 | 1:07 | 44 | 10+4.28 | " | 10.17 | -5.84 | | | | DP | |
| | 1626 | 1:13 | 49 | 10+4.20 | " | 10.09 | -5.76 | | | | DP | |
| | 1630 | 1:17 | 54 | 10+4.17 | " | 10.06 | -5.73 | | | | DP | |
| | 1635 | 1:23 | 59 | 10+4.12 | " | 10.01 | -5.68 | | | | DP | |
| | 1640 | 1:28 | 64 | 10+4.09 | " | 9.98 | -5.65 | | | | DP | |
| | 1645 | 1:33 | 69 | 10+4.01 | " | 9.90 | -5.57 | | | | DP | |
| | 1650 | 1:38 | 74 | 10+3.97 | " | 9.86 | -5.53 | | | | DP | |
| | 1655 | 1:43 | 79 | 10+3.74 | " | 9.63 | -5.30 | | | | DP | |
| | 1700 | 1:48 | 84 | 10+3.97 | " | 8.86 | -4.53 | | | | DP | |
| | 1710 | 1:58 | 94 | 10+1.98 | " | 7.87 | -3.54 | | | | DP | |
| | 1720 | 2:08 | 104 | 10+1.12 | " | 7.01 | -2.68 | | | | DP | |
| | 1730 | 2:18 | 114 | 10+0.99 | " | 6.32 | -2.05 | | | | DP | |
| | 1740 | 2:28 | 124 | 10+0.0 | " | 5.89 | -1.56 | | | | DP | |
| | 1750 | 2:38 | 134 | 5+9.60 | " | 5.49 | -1.16 | | | | DP | |
| | 1800 | 2:48 | 144 | 5+4.35 | " | 5.24 | -0.91 | | | | WH | |
| | 1810 | 2:58 | 154 | 5+4.18 | " | 5.07 | -0.74 | | | | DP | |
| | 1820 | 3:08 | 164 | 5+4.09 | " | 4.98 | -0.65 | | | | DP | 90% recovered |
| | 1830 | 3:18 | 174 | 5+4.00 | " | 4.89 | -0.56 | | | | WH | |
| | 1840 | 3:28 | 184 | 5+3.94 | " | 4.83 | -0.50 | | | | WH | |
| | 1855 | 3:43 | 199 | 5+3.89 | " | 4.73 | -0.40 | | | | DP | |

ROCKY FLATS SOLAR PONDS

WATER LEVEL SUMMARY

| <u>WELL</u> <u>NUMBER</u> | <u>DATE</u> | <u>GROUND</u> <u>SURFACE</u> <u>ELEVATION</u> | <u>TOP OF</u> <u>CASING</u> <u>ELEVATION</u> | <u>STICK</u> <u>UP</u> | <u>DEPTH</u> <u>OF SI</u> <u>BASE</u> | <u>WATER</u> <u>DEPTH</u> <u>BELOW TOC</u> | <u>WATER</u> <u>SURFACE</u> <u>ELEVATION</u> |
|------------------------------|-------------|---|--|---------------------------|---|--|--|
| 1586 | 09/04/86 | 5845.61 | 5847.93 | 2.32 | 14.69 | 7.05 | 5840.88 |
| | 09/05/86 | | | | | 7.17 | 5840.76 |
| | 09/06/86 | | | | | 7.05 | 5840.88 |
| | 09/08/86 | | | | | 6.67 | 5841.26 |
| | 10/13/86 | | | | | 6.60 | 5841.33 |
| | 11/26/86 | | | | | 6.89 | 5841.04 |
| | 01/01/87 | | | | | 6.67 | 5841.26 |
| | 02/01/87 | | | | | 6.40 | 5841.53 |
| | 04/01/87 | | | | | 4.96 | 5842.97 |
| | 05/06/87 | | | | | 5.44 | 5842.49 |
| | 06/01/87 | | | | | 6.71 | 5841.22 |
| | 07/08/87 | | | | | 6.70 | 5841.23 |
| | 08/04/87 | | | | | 7.10 | 5840.83 |
| | 08/05/87 | | | | | 7.00 | 5840.93 |
| | 09/01/87 | | | | | 6.80 | 5841.13 |
| | 09/28/87 | | | | | 7.10 | 5840.83 |
| | 11/03/87 | | | | | 6.80 | 5841.13 |
| | 12/08/87 | | | | | 6.70 | 5841.23 |
| | 01/07/88 | | | | | 6.70 | 5841.23 |
| | 02/04/88 | | | | | 6.70 | 5841.23 |
| | 03/14/88 | | | | | 6.60 | 5841.33 |
| | 04/11/88 | | | | | 6.70 | 5841.23 |

SATURATED THICKNESS IN WELL # 15-86(SP)



INDEX OF DATA

Boring No.: 16-86

Completed as well? Yes

Data in File

- ☒ Log of Borehole
- ☒ Well Construction Summaries
- ☐ Well Development Summaries
- ☒ Hydraulic Conductivity Test Data and Results
- ☒ Packer Test Data and Results
- ☒ Water Level Data
- ☒ Saturated Thickness Hydrographs

Project: Rocky Flats Plant

LOG OF BORING NO.

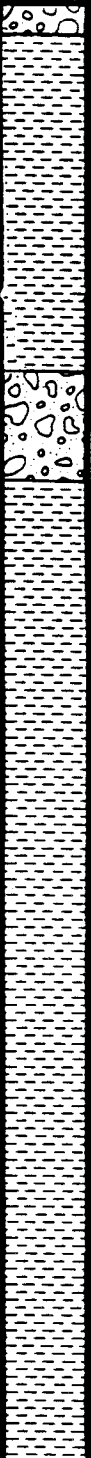
16-86

Date Drilled 8/15/85; 8/25/86

Coordinates N 38759.9 E 22159.7

Boring Method Hollow Stem Auger/NC Core

Ground Surface Elevation 5864.74

| Elev. (feet) | Depth (feet) | Sample Type | Graphic Log | Material Description | Penetration Resistance (Blows/Inch) | | Water Content (%) | | Other Tests |
|-----------------|-----------------|----------------|--|--|---|----|-------------------------|----|----------------|
| | | | | | 20 | 40 | 20 | 40 | |
| | 0 | |  | <p>VALLEY FILL ALLUVIUM</p> <p>0-0.4'-Sample. Recovered 0.4/0.4'=100%. GRAVEL: dark yellowish orange (10YR 6/6) sandy, silty, and clayey; subangular grains of feldspar and quartz; poorly sorted; unconsolidated; dry.</p> <p>0.4-5.0'-Sample. Recovered 4.0/4.6'=87%. CLAY: dusky yellowish brown (10YR 2/2) silty clay; some quartzite pebbles and cobbles; poorly sorted; subangular to subrounded gravel; unconsolidated; dry to damp.</p> <p>5.0-6.5'-Sample. Recovered 1.5/1.5'=100%. GRAVEL: dark yellowish brown (10YR 4/2) sandy, silty and clayey; granitic pebbles; poorly sorted; unconsolidated; moist.</p> <p>6.5-7.0'-Sample. Recovered 1.5/1.5'=100%. CLAY: dark yellowish brown (10YR 4/2); silty; trace iron staining; unconsolidated; damp.</p> <p>ARAPAHOE FORMATION</p> <p>7.0-10.5'-Sample. Recovered 3.5/3.5'=100%. CLAYSTONE: dark yellowish brown (10YR 4/2); silty; trace iron staining; laminated; weathered; dry.</p> <p>10.5-13.0'-Sample. Recovered 2.5/2.5'=100%. CLAYSTONE: dark yellowish brown (10YR 4/2); silty; trace iron staining; laminated; weathered; dry.</p> <p>13.0-18.0'-Sample. Recovered 4.0/5.0'=80%. CLAYSTONE: dark yellowish brown (10YR 4/2); silty; iron stained; laminated; weathered; dry.</p> | | | | | |

Remarks

Logged by: L. Pivonka & T. Gulliver

Checked by: 

Project No.

106PO6222

Hydro-Search, Inc.

Page 1 of 4

| | | | | | | | | | |
|--|--|--|--|----------------------------------|--|--|--|-------|--|
| Project: Rocky Flats Plant | | | | LOG OF BORING NO. | | | | 16-86 | |
| Date Drilled: 8/15/86; 8/25/86 | | | | Coordinates N 38759.9 E 22159.7 | | | | | |
| Boring Method: Hollow Stem Auger/NC Core | | | | Ground Surface Elevation 5864.74 | | | | | |

| Elev. (feet) | Depth (feet) | Sample Type | Graphic Log | Material Description | Penetration Resistance (Blows/Inch) 20 40 | Water Content (%) 20 40 | Other Tests |
|-----------------|-----------------|----------------|----------------|--|--|------------------------------------|----------------|
| | 20 | | | 18.0-23.0'-Sample. Recovered 4.3/5.0'=86%. CLAYSTONE: medium gray (N 5); silty; laminated; unweathered; dry. | | | |
| | | | | 23.0-26.0'-Sample. Recovered 3.0/3.0'=100%. CLAYSTONE: medium gray (N 5); silty; trace iron staining; laminated; dry. | | | |
| | | | | 26.0-28.1'-Sample. Recovered 2.1/2.1'=100%. RQD 1.9/2.1'=90%. CLAYSTONE: medium gray (N 4); carbonaceous laminae; some limonitic partings; damp. | | | |
| | 25 | | | 28.1-32.8'-Sample. Recovered 4.7/4.7'=100%. RQD 4.7/4.7'=100%. CLAYSTONE: medium gray (N 4); carbonaceous laminae; some limonitic partings; damp. | | | |
| | | | | 32.8-34.0'-Sample. Recovered 1.2/1.2'=100%. RQD 1.2/1.2'=100%. CLAYSTONE: Same as above; damp. | | | |
| | | | | 34.0-39.0'-Sample. Recovered 3.8/5.0'=76%. RQD 3.4/3.8'=90%. | | | |
| | | | | 34.0-35.2'. Lost core. | | | |
| | 35 | | | 35.2-37.0'. CLAYSTONE: medium gray (N 4); carbonaceous laminae; some limonitic partings; damp. | | | |
| | | | | 37.0-39.0'. CLAYSTONE: Same as above; damp. | | | |
| | | | | 39.0-44.0'-Sample. Recovered 5.0/5.0'=100%. RQD 5.0/5.0'=100%. | | | |
| | | | | 39.0-40.1'. CLAYSTONE: Same as above; damp. | | | |
| | 40 | | | | | | |

| | | |
|---------|-------------------------------------|--------------------------------|
| Remarks | Logged by: L. Pivonka & T. Gulliver | Checked by: <i>[Signature]</i> |
|---------|-------------------------------------|--------------------------------|

| | | |
|--------------------------|---------------------------|-------------|
| Project No. 106P06222 | Hydro-Search, Inc. | Page 2 of 4 |
|--------------------------|---------------------------|-------------|

Project: Rocky Flats Plant

LOG OF BORING NO.

16-86

Date Drilled 8/15/86; 8/25/86

Coordinates N 38759.9 E 22159.7

Boring Method Hollow Stem Auger/NC Core

Ground Surface Elevation 5864.74

| Elev. (feet) | Depth (feet) | Sample Type | Graphic Log | Material Description | Penetration Resistance (Blows/Inch) | | Water Content (%) | | Other Tests |
|-----------------|-----------------|----------------|----------------|---|---|----|-------------------------|----|----------------|
| | | | | | 20 | 40 | 20 | 40 | |
| | 40 | | | 40.1-41.4'. SILTSTONE: medium gray (N 4); laminated; well sorted; damp. | | | | | |
| | | | | 41.4-41.9'. SILTSTONE: dark gray (N 3); laminated; well sorted; damp. | | | | | |
| | | | | 41.9-43.8'. SANDSTONE: medium gray (N 5); very fine-grained; massive; some carbonaceous detritus; damp. | | | | | |
| | 45 | | | 43.8-44.0'. SILTSTONE: dark gray (N 3); clayey; laminated; damp. | | | | | |
| | | | | 44.0-49.0'-Sample. Recovered 5.0/5.0'=100%. RQD 4.5/5.0'=90%. | | | | | |
| | | | | 44.0-44.8'. SILTSTONE: dark gray (N 3); clayey; evenly laminated; damp. | | | | | |
| | 50 | | | 44.8-49.0'. CLAYSTONE: dark gray (N 3); laminated; damp. | | | | | |
| | | | | 49.0-54.0'-Sample. Recovered 5.0/5.0'=100%. RQD 4.4/5.0'=88%. | | | | | |
| | | | | 49.0-49.6'. SILTSTONE: dark gray (N 3); slightly calcareous; laminated; damp. | | | | | |
| | 55 | | | 49.6-51.2'. CLAYSTONE: grayish black (N 2); silty; damp. | | | | | |
| | | | | 51.2-52.3'. SILTSTONE: grayish black (N 2); clayey; laminated; damp. | | | | | |
| | | | | 52.3-54.0'. SILTSTONE: dark gray (N 3); some very fine-grained sand (light gray (N 7)); convolute bedding; damp to moist. | | | | | |
| | 60 | | | 54.0-59.0'-Sample. Recovered 1.3/5.0'=26%. RQD 0/1.3'=0%. | | | | | |

Remarks

Logged by: L. Pivonka & T. Gulliver

Checked by: *[Signature]*

Project No.

106P06222

Hydro-Search, Inc.

Page 3 of 4

| | | | | | |
|--|--|--|---|--|--|
| Project: Rocky Flats Plant | | | LOG OF BORING NO. 16-86 | | |
| Date Drilled 8/15/86; 8/25/86 | | | Coordinates N 38759.9 E 22159.7 | | |
| Boring Method Hollow Stem Auger/NC Core | | | Ground Surface Elevation 5864.74 | | |

| Elev. (feet) | Depth (feet) | Sample Type | Graphic Log | Material Description | Penetration Resistance (Blows/Inch) 20 40 | Water Content (%) 20 40 | Other Tests |
|-----------------|-----------------|----------------|----------------|---|--|----------------------------------|----------------|
| | 60 | | | 54.0-54.5'. CLAYSTONE: medium dark gray (N 4); massive; damp. | | | |
| | | | | 54.5-59.0'. SILTSTONE: dark gray (N 3) and very fine-grained light gray (N 7) sandstone; even interlaminated; damp. | | | |
| | | | | 59.0-64.0'-Sample. Recovered 5.0/5.0'=100%. RQD 2.5/5.0'=50%. | | | |
| | 65 | | | 59.2-60.7'. SILTSTONE: medium gray (N 5); clayey; laminated; damp. | | | |
| | | | | 60.7-61.4'. CLAYSTONE: grayish black (N 2); laminated; damp. | | | |
| | | | | 61.4-64.0'. CLAYSTONE: medium gray (N 5); silty; laminated; damp. | | | |
| | 70 | | | TOTAL DEPTH: 64.0' | | | |
| | 75 | | | | | | |
| | 80 | | | | | | |

| | | | | | |
|---------------------------------|--|-------------------------------------|--|-------------|--|
| Remarks | | Logged by: L. Pivonka & T. Gulliver | | Checked by: | |
| Project No. 106P06222 | | Hydro-Search, Inc. | | Page 4 of 4 | |

WELL CONSTRUCTION SUMMARY

LOCATION or COORDS: _____
N 38759.9 E 22159.7

ELEVATION: GROUND LEVEL 5864.74'
TOP OF CASING 5866.60'

DRILLING SUMMARY:

TOTAL DEPTH Well: 45.06' Hole: 64.00'
BOREHOLE DIAMETER 0.00' - 26.00': 7 1/4"
26.00'-45.00': 4 3/4" 45.00'-64.00': 3 7/8"
DRILLER Boyles Brothers Drilling Co.
15865 W. 5th Avenue, Golden, CO
Jim Horne, Paul Wiebe
RIG 0.00'-26.00' Mobile B57, 26.00'-64.00'
0.00'-26.00' Blade bit ^{Failing 1500}
26.00'-64.00' Christensen carbide, tricone
4 3/4 reamer
DRILLING FLUID 0.00'-26.00' None
26.00'-64.00' air/water mist
SURFACE CASING 5" x 28.55' steel w/ locking cap

WELL DESIGN:

BASIS: GEOLOGIC LOG X GEOPHYSICAL LOG

CASING STRING(S): C=CASING S=SCREEN

[illegible]

CASING: C1 5" I.D. steel surface casing
C2 2" I.D., Sch. 5, Type 316 stain-
less steel, threaded and flush
jointed

SCREEN: SI 2" I.D., Sch. 5, Type 316 stain-
less steel, threaded and flush
jointed, 0.010" wire wrap screen
0.25' welded bottom cap.

CENTRALIZERS Type 304 stainless steel
40.49' - 41.73'

FILTER MATERIAL 32-42 silica sand
37.65' - 45.06'

CEMENT Portland Type I
0.00' - 35.25'

OTHER 3/8" bentonite pellets
35.25' - 37.65'

45.06' - 47.15'
10-20 silica sand: 47.15' - 64.00'

CONSTRUCTION TIME LOG:

| TASK | START | | FINISH | |
|--------------------|--------------|------|--------------|------|
| | DATE 1986 | TIME | DATE 1986 | TIME |
| DRILLING: | | | | |
| 7 1/2" auger | 8/15 | 1330 | 8/15 | 1530 |
| NC core | 8/25 | 0920 | 8/25 | 1200 |
| Reaming | 8/27 | 1700 | 8/27 | 1725 |
| GEOPHYS. LOGGING: | — | — | — | — |
| CASING: | | | | |
| 5" steel | 8/18 | 0907 | 8/18 | 1110 |
| 2" stainless | 8/28 | 1012 | 8/28 | 1014 |
| | | | | |
| FILTER PLACEMENT | 8/28 | 1018 | 8/28 | 1030 |
| CEMENTING: | 8/28 | 1130 | 8/28 | 1135 |
| DEVELOPMENT: | 9/2 | 1725 | 9/18 | 1240 |
| OTHER: | | | | |
| Bentonite | 8/28 | 1040 | 8/28 | 1041 |
| | 8/28 | 0945 | 8/28 | 0948 |
| Packer testing | 8/27 | 0900 | 8/27 | 1645 |
| Cementing 5" steel | 8/18 | 0918 | 8/18 | 0938 |
| | | | | |

WELL DEVELOPMENT

See Well Development Summary Sheet.

COMMENTS:

No water encountered during drilling.

Top of stainless steel casing: 1.86'

NC core 26.00' - 64.00'

Reamed from 26.00' - 45.00'

CLIENT/SUBJECT _____ W.O. NO. _____

TASK DESCRIPTION _____ TASK NO. _____

| | | | |
|----------------------|------------|------------|--|
| PREPARED BY _____ | DEPT _____ | DATE _____ | APPROVED BY DEPT _____ DATE _____ |
| MATH CHECK BY _____ | DEPT _____ | DATE _____ | |
| METHOD REV. BY _____ | DEPT _____ | DATE _____ | |

WELL 16-86

Hydraulic Conductivity (cm/sec) = 6×10^{-8}

Flowrate (gpm) = 0.5 gpm

Screened Interval (ft below G.L.) = 39.06 - 45.06

| | |
|--------------|------------|
| 39.06 - 40.1 | claystone |
| 40.1 - 41.9 | siltstone |
| 41.9 - 43.8 | sand stone |
| 43.8 - 44.8 | siltstone |
| 44.8 - 45.06 | claystone |

Method of Analysis: residual-drawdown Plot

(Driscoll, 1926 - pg 256.)

CLIENT/SUBJECT _____ W.O. NO. _____

TASK DESCRIPTION _____ TASK NO. _____

PREPARED BY _____ DEPT _____ DATE _____

MATH CHECK BY _____ DEPT _____ DATE _____

METHOD REV. BY _____ DEPT _____ DATE _____

| | |
|-------------|------------|
| APPROVED BY | |
| | |
| DEPT _____ | DATE _____ |

WELL 16-86

$$T \text{ (gpd/ft)} = \frac{264 Q}{\Delta S'} = \frac{(264) (.5)}{17,100} = 7.72 \times 10^{-3}$$

where $Q \text{ (gpm)} = 6 \text{ gal} / 12 \text{ min} = .5 \text{ gpm}$

$$\Delta S' = \text{ft. change in residual drawdown / log cycle}$$

$$= 17,100 \text{ ft} / \log \text{ cycle (see attached plot)}$$

$$K \text{ (gpd/ft}^2\text{)} = T / b = 7.72 \times 10^{-3} / 6.00 = 1.29 \times 10^{-3}$$

where $b \text{ (ft)} = 6.00 \text{ ft}$

$$K \text{ (cm/sec)} = 1.29 \times 10^{-3} \text{ gpd/ft}^2 \times \frac{4.72 \times 10^{-5} \text{ cm/sec}}{\text{gpd/ft}^2} = 6 \times 10^{-8}$$

This method is valid where $u \leq 0.01$

solving for t for $u \leq 0.01$

$$t \text{ (min)} = \frac{r^2 S}{4 T u} = \frac{(0.198) \times 10^{-3}}{(4)(7.72 \times 10^{-3})(.01)} \times \frac{1440 \text{ min}}{\text{day}} \times \frac{7.482 \text{ gal}}{\text{ft}^3}$$

$$= 1368 \text{ min.}$$

where $r \text{ (ft)} = \left(\frac{4.75}{24} \right) \text{ ft} = 0.198 \text{ ft}$

$S = 10^{-3}$ assumed S for confined aquifer
 $\Delta S'$ is based on points where $t \geq 7551 \text{ min.}$

RAW DATA

WELL # 17-86

WELL DIAMETER= 7.25 INCHES

CASING DIAMETER= 2.00 INCHES

VOLUME OF WATER= .19 GALLONS*

LENGTH OF AQUIFER TESTED= 9.35 FEET

VALUE OF H₀= 1.17 FEET

STATIC WATER LEVEL= 4.63 FEET

LENGTH OF SCREEN= 13.98 FEET

WATER TABLE TO BOTTOM OF WELL= 9.35 FEET

* Actual volume of water removed not recorded. 0.19 gallons back-calculated from first recorded residual drawdown (1.17 ft).

| TIME | WATER LEVEL (FEET) | TIME SINCE TEST BEGAN (MINUTES) |
|----------|-----------------------|------------------------------------|
| 14. 7.15 | 5.80 | 42.25 |
| 14. 7.30 | 5.80 | 42.50 |
| 14. 8. 0 | 5.80 | 43.00 |
| 14. 8.30 | 5.78 | 43.50 |
| 14. 9. 0 | 5.72 | 44.00 |
| 14. 9.30 | 5.71 | 44.50 |
| 14.10. 0 | 5.70 | 45.00 |
| 14.11. 0 | 5.65 | 46.00 |
| 14.12. 0 | 5.61 | 47.00 |
| 14.13. 0 | 5.58 | 48.00 |
| 14.14. 0 | 5.53 | 49.00 |
| 14.15. 0 | 5.50 | 50.00 |
| 14.16. 0 | 5.48 | 51.00 |
| 14.17. 0 | 5.47 | 52.00 |
| 14.18. 0 | 5.44 | 53.00 |
| 14.19. 0 | 5.39 | 54.00 |
| 14.20. 0 | 5.39 | 55.00 |
| 14.21. 0 | 5.39 | 56.00 |
| 14.22. 0 | 5.39 | 57.00 |
| 14.23. 0 | 5.38 | 58.00 |
| 14.25. 0 | 5.38 | 60.00 |
| 14.30. 0 | 5.28 | 65.00 |
| 14.36.30 | 5.21 | 71.50 |
| 14.40. 0 | 5.22 | 75.00 |
| 14.50. 0 | 5.12 | 85.00 |
| 15. 0. 0 | 5.10 | 95.00 |
| 15.10. 0 | 5.01 | 105.00 |
| 15.20. 0 | 5.01 | 115.00 |
| 15.30. 0 | 5.01 | 125.00 |

WELL # 17-86

WELL DIAMETER= 7.25 INCHES

CASING DIAMETER= 2.00 INCHES

VOLUME OF WATER REMOVED OR ADDED TO WELL= .19 GALLONS

LENGTH OF AQUIFER TESTED= 9.35 FEET

VALUE OF H₀= 1.17 FEET

STATIC WATER LEVEL= 4.63 FEET

SLUG TEST DATA:

| TIME SINCE TEST BEGAN (MINUTES) | WATER LEVEL (FEET) | DRAWDOWN (FEET) | HEAD RATIO | RECIPROCAL TIM (1/MINUTES) |
|------------------------------------|-----------------------|--------------------|------------|-------------------------------|
| 42.25 | 5.80 | 1.17 | 1.000 | .024 |
| 42.50 | 5.80 | 1.17 | 1.000 | .024 |
| 43.00 | 5.80 | 1.17 | 1.000 | .023 |
| 43.50 | 5.78 | 1.15 | .983 | .023 |
| 44.00 | 5.72 | 1.09 | .932 | .023 |
| 44.50 | 5.71 | 1.08 | .923 | .022 |
| 45.00 | 5.70 | 1.07 | .915 | .022 |
| 46.00 | 5.65 | 1.02 | .872 | .022 |
| 47.00 | 5.61 | .98 | .838 | .021 |
| 48.00 | 5.58 | .95 | .812 | .021 |
| 49.00 | 5.53 | .90 | .769 | .020 |
| 50.00 | 5.50 | .87 | .744 | .020 |
| 51.00 | 5.48 | .85 | .726 | .020 |
| 52.00 | 5.47 | .84 | .718 | .019 |
| 53.00 | 5.44 | .81 | .692 | .019 |
| 54.00 | 5.39 | .76 | .650 | .019 |
| 55.00 | 5.39 | .76 | .650 | .018 |
| 56.00 | 5.39 | .76 | .650 | .018 |
| 57.00 | 5.39 | .76 | .650 | .018 |
| 58.00 | 5.38 | .75 | .641 | .017 |
| 60.00 | 5.38 | .75 | .641 | .017 |
| 65.00 | 5.28 | .65 | .556 | .015 |
| 71.50 | 5.21 | .58 | .496 | .014 |
| 75.00 | 5.22 | .59 | .504 | .013 |
| 85.00 | 5.12 | .49 | .419 | .012 |
| 95.00 | 5.10 | .47 | .402 | .011 |
| 105.00 | 5.01 | .38 | .325 | .010 |
| 115.00 | 5.01 | .38 | .325 | .009 |
| 125.00 | 5.01 | .38 | .325 | .008 |

12:20:46.25

AIRLIFT - RECOVERY ANALYSIS FOR WELL 17-86

THU 06-09-19E

WELL # 17-86

PERMEABILITY BASED ON COOPER, BREDEHOEFT, AND PAPADOPULOS METHOD

PERMEABILITY=3.77E-04/ MATCH TIME (IN MINUTES)
STORAGE COEF= 7.61E-02* ALPHA
COMPUTER CALCULATES
ALPHA=1.00E-05 MATCH TIME= 5.43E+01
PERMEABILITY= 6.95E-06 CM/SEC
STORAGE COEF=7.61E-07
CORRELATION NUMBER= .99

PERMEABILITY BASED ON REGRESSION FIT OF HEAD RATIO DATA

HVORSLEV PERMEABILITY=6.48E-04 / LAG TIME
BOUWER PERMEABILITY=7.66E-04 * -SLOPE
COMPUTER CALCULATES
HVORSLEV PERMEABILITY=6.47E-06 CM/SEC
BOUWER PERMEABILITY=4.75E-06 CM/SEC
REGRESSION STATISTICS
X ON Y
INTERCEPT= .17
SLOPE=-5.98E-03
Y ON X
INTERCEPT= .20
SLOPE=-6.42E-03
CORRELATION COEFFICIENT= -.97
CALCULATIONS INDICATE THAT A VALUE OF 5.03 FEET FOR HO
OR A VALUE OF .964 INCHES FOR EFFECTIVE CASING DIA.
MAY YIELD BETTER RESULTS

PERMEABILITY BASED ON REGRESSION FIT OF DATA - FERRIS & KNOWLES MET

PERMEABILITY=1.10E-04 / SLOPE
PERMEABILITY=2.07E-06 CM/SEC
REGRESSION STATISTICS
X ON Y
INTERCEPT= -.12
SLOPE= 5.20E+01
Y ON X
INTERCEPT= -.15
SLOPE= 5.39E+01
CORRELATION COEFFICIENT= .98

12:21:59.69

AIRLIFT - RECOVERY ANALYSIS FOR WELL 17-86

THU 06-09

| WELL # | PERMEABILITY METHOD 1 | PERMEABILITY METHOD 2 | STORAGE COEF METHOD 2 | PERMEABILITY METHOD 3 | PERMEABILI METHOD 4 |
|--------|--------------------------|--------------------------|--------------------------|--------------------------|------------------------|
| 17-86 | 6.47E-06 | 6.95E-06 | 7.61E-07 | 2.07E-06 | 4.75E-06 |

* METHOD 1 IS HVORSLEV

METHOD 2 IS COOPER, BREDEHOEFT, AND PAPADOPULOS

METHOD 3 IS FERRIS AND KNOWLES

METHOD 4 IS BOUWER

AQUIFER TEST DATA

WELL 17-86
PUMPING or OBSERVATION WELL
PUMPING or RECOVERY DATA
PAGE 1 OF 2

TYPE OF AQUIFER TEST RISE/LIFT RECOVERY TEST
HOW Q MEASURED N/A
HOW W.L.'s MEASURED OLYMPIC
RAD./DIST. OF/FROM PUMPING WELL 1"
MEAS. POINT FOR W.L.'s _____
ELEVATION OF MEAS. POINT _____

DEPTH OF PUMP/AIRPIPE _____
PUMP ON: date 11-19-86 time _____
PUMP OFF: date 11-19-86 time _____
DURATION OF AQUIFER TEST _____

LOCATION
PERSONNEL

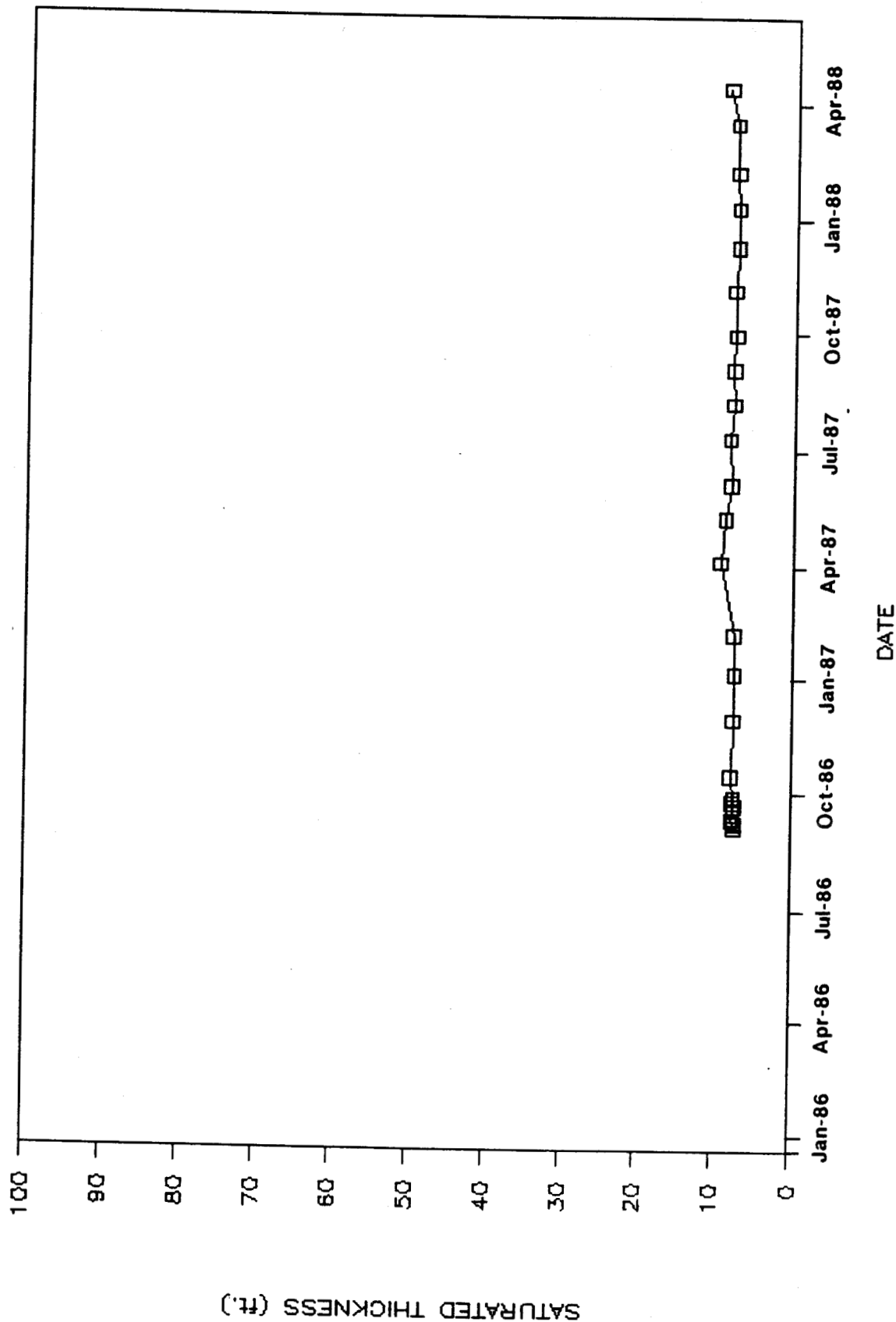
PROJECT

| TIME | | | | WATER LEVEL DATA | | | | | DISCHARGE | | RECORDED BY | COMMENTS |
|---------------------|------------|-------|----|--|----------------------------|-------------|---------|--|-----------|---|-------------|----------------------------|
| t = _____ at t' = 0 | | | | STATIC WATER LEVEL <u>5+1.32 (NOT ADJ)</u> | | | | | | | | |
| DAY | CLOCK TIME | t | t' | READING | CONVERSIONS CORRECTIONS | WATER LEVEL | s or s' | | READING | Q | | |
| 1 | | | | | 1.69 | | | | | | 16 | 1.69 |
| 1 | 13:25 | | | | | | | | | | | STARTED LIFTING |
| 1 | 13:55 | | | | | | | | | | | STOPPED LIFTING |
| | 14:04 | | | | | | | | | | | STOP LIFTING |
| | | | | | | | | | | | | LAST LIFT CONTINUOUS 5 MIN |
| | 14:05:30 | | | 5+1.87 | | | | | | | | 9.6% 6.43 = 54 |
| | 14:06 | | | +1.65 | 1.69 | 5' | | | | | 16 | |
| | 14:06:30 | | | +1.84 | 1.69 | 5' | | | | | | |
| | 14:07:00 | 00 | | +2.49 | 1.69 | 5.80 | 1.17 | | | | | |
| | 14:07:30 | .5 | | 2.49 | 1.62 | 5.80 | 1.17 | | | | | |
| | 14:08 | 1.0 | | 2.49 | | 5.80 | 1.17 | | | | | |
| | 14:08:30 | 1.5 | | 2.47 | | 5.79 | 1.15 | | | | | |
| | 14:09 | 2.0 | | 2.41 | | 5.72 | 1.09 | | | | | |
| | 14:09:30 | 2.5 | | 2.40 | | 5.71 | 1.08 | | | | | |
| | 14:10 | 3.0 | | 2.39 | | 5.70 | 1.07 | | | | | |
| | 14:11 | 4 | | 2.34 | | 5.65 | 1.02 | | | | | |
| | 14:12 | 5 | | 2.30 | | 5.61 | 0.98 | | | | | |
| | 14:13 | 6 | | 2.27 | | 5.58 | 0.95 | | | | | |
| | 14:14 | 7 | | 2.22 | | 5.53 | 0.90 | | | | | |
| | 14:15 | 8 | | 2.19 | | 5.50 | 0.87 | | | | | |
| | 14:16 | 9 | | 2.17 | | 5.48 | 0.85 | | | | | |
| | 14:17 | 10 | | 2.16 | | 5.47 | 0.84 | | | | | |
| | 14:18 | 11 | | 2.13 | | 5.44 | 0.81 | | | | | |
| | 14:19 | 12 | | 2.12 | | 5.43 | 0.76 | | | | | |
| | 14:20 | 13 | | 2.08 | | 5.39 | 0.76 | | | | | |
| | 14:21 | 14 | | 2.08 | | 5.39 | 0.76 | | | | | |
| | 14:22 | 15 | | 2.08 | | 5.39 | 0.76 | | | | | |
| | 14:23 | 16 | | 2.07 | | 5.38 | 0.75 | | | | | |
| | 14:25 | 18 | | 2.07 | | 5.38 | 0.75 | | | | | |
| | 14:30 | 23 | | 1.97 | | 5.28 | 0.65 | | | | | |
| | 14:36:30 | 26:15 | | 1.90 | | 5.21 | 0.58 | | | | | |
| | 14:40 | 29:30 | | 1.91 | | 5.22 | 0.59 | | | | | |
| | 14:50 | 40 | | 1.81 | | 5.12 | 0.49 | | | | | |
| | 15:00 | 50 | | 1.79 | | 5.10 | 0.47 | | | | | |
| | 15:10 | 60 | | 1.70 | | 5.01 | 0.38 | | | | | |
| 1 | 15:20 | 70 | | 1.70 | | 5.01 | 0.38 | | | | | |
| 1 | 15:30 | 80 | | 1.70 | | 5.01 | 0.38 | | | | | |
| 2 | 11:21 | | | 5+1.30 | | 4.61 | -0.02 | | | | 18 | |

ROCKY FLATS SOLAR PONDS
WATER LEVEL SUMMARY

| <u>WELL</u> <u>NUMBER</u> | <u>DATE</u> | <u>GROUND</u> <u>SURFACE</u> <u>ELEVATION</u> | <u>TOP OF</u> <u>CASING</u> <u>ELEVATION</u> | <u>STICK</u> <u>UP</u> | <u>DEPTH</u> <u>OF SI</u> <u>BASE</u> | <u>WATER</u> <u>DEPTH</u> <u>BELOW TOC</u> | <u>WATER</u> <u>SURFACE</u> <u>ELEVATION</u> |
|------------------------------|-------------|---|--|---------------------------|---|--|--|
| 1786 | 09/02/86 | 5865.26 | 5866.55 | 1.29 | 13.98 | 6.49 | 5860.06 |
| | 09/05/86 | | | | | 6.54 | 5860.01 |
| | 09/06/86 | | | | | 6.50 | 5860.05 |
| | 09/08/86 | | | | | 6.22 | 5860.33 |
| | 09/09/86 | | | | | 6.31 | 5860.24 |
| | 09/17/86 | | | | | 6.46 | 5860.09 |
| | 09/19/86 | | | | | 6.50 | 5860.05 |
| | 09/22/86 | | | | | 6.33 | 5860.22 |
| | 09/25/86 | | | | | 6.43 | 5860.12 |
| | 10/13/86 | | | | | 6.10 | 5860.45 |
| | 11/26/86 | | | | | 6.35 | 5860.20 |
| | 01/01/87 | | | | | 6.42 | 5860.13 |
| | 02/01/87 | | | | | 6.35 | 5860.20 |
| | 04/01/87 | | | | | 4.54 | 5862.01 |
| | 05/06/87 | | | | | 5.10 | 5861.45 |
| | 06/01/87 | | | | | 5.84 | 5860.71 |
| | 07/08/87 | | | | | 5.70 | 5860.85 |
| | 08/05/87 | | | | | 6.10 | 5860.45 |
| | 09/01/87 | | | | | 6.00 | 5860.55 |
| | 09/28/87 | | | | | 6.30 | 5860.25 |
| | 11/03/87 | | | | | 6.10 | 5860.45 |
| | 12/08/87 | | | | | 6.40 | 5860.15 |
| | 01/07/88 | | | | | 6.40 | 5860.15 |
| | 02/04/88 | | | | | 6.30 | 5860.25 |
| | 03/14/88 | | | | | 6.20 | 5860.35 |
| | 04/11/88 | | | | | 5.20 | 5861.35 |

SATURATED THICKNESS IN WELL # 17-86(SP)



INDEX OF DATA

Boring No.: 18-86

Completed as well? Yes

Data in File

- ☒ Log of Borehole
- ☒ Well Construction Summaries
- ☐ Well Development Summaries
- ☐ Hydraulic Conductivity Test Data and Results
- ☐ Packer Test Data and Results
- ☒ Water Level Data
- ☒ Saturated Thickness Hydrographs

Project: Rocky Flats Plant

LOG OF BORING NO. 18-86

Date Drilled 8/21/86 to 8/22/86

Coordinates N 38532.4 E 22729.8

Boring Method Hollow Stem Auger

Ground Surface Elevation 5882.82

| Elev. (feet) | Depth (feet) | Sample Type | Graphic Log | Material Description | Penetration Resistance (Blows/Inch) | | Water Content (%) | | Other Tests |
|-----------------|-----------------|----------------|----------------|--|---|----|-------------------------|----|----------------|
| | | | | | 20 | 40 | 20 | 40 | |
| | 0 | | | ARTIFICIAL FILL 0-0.6'-Sample. Recovered 0.6/0.6'=100%. GRAVEL: pale yellowish brown (10YR 6/2); granite and quartzite sandy gravel; poorly sorted; unconsolidated; dry. | | | | | |
| | 5 | | | 0.6-5.0'-Sample. Recovered 3.4/4.4'=77%. CLAY: moderate yellowish brown (10YR 5/4) and dark yellowish brown (10YR 4/2); silty; trace gray micaceous quartzite cobble; poorly sorted; hard; damp. | | | | | |
| | | | | 5.0-8.0'-Sample. Recovered 0.0/3.0'=0%. | | | | | |
| | 10 | | | ARAPAHOE FORMATION 8.0-10.5'-Sample. Recovered 2.5/2.5'=100%. CLAYSTONE: medium light gray (N 6) to grayish black (N 2) with dark yellowish orange (10YR 6/6) mottling; sandy; sandy iron stained intervals from 8.0-8.2' and 9.5-10.3'; dry. | | | | | |
| | 15 | | | | | | | | |
| | 20 | | | TOTAL DEPTH: 10.5' | | | | | |

Remarks Logged by: L. Pivonka

Checked by: *[Signature]*

Project No.
106P06222

Hydro-Search, Inc.

Page 1 of 1

WELL CONSTRUCTION SUMMARY

LOCATION or COORDS: _____
 N 38532.4 E 22729.8

ELEVATION: GROUND LEVEL 5882.82'
 TOP OF CASING 5885.49'

DRILLING SUMMARY:

TOTAL DEPTH Well: 7.50' Hole: 10.50'

BOREHOLE DIAMETER 7 1/2"

DRILLER Boyles Brothers Drilling Co.

15865 W. 5th Avenue

Golden, CO (Jim Horn)

RIG Mobile B-57

BIT(S) Bull nose bit

DRILLING FLUID None

SURFACE CASING 5" x 5' steel w/ locking cap

WELL DESIGN:

BASIS: GEOLOGIC LOG X GEOPHYSICAL LOG _____

CASING STRING(S): C=CASING S=SCREEN

0.00' 3.74' C1

3.74' 7.50' S1

CASING: C1 2" I.D. Sch. 5 type 316 stainless steel, threaded and flush jointed.

SCREEN: S1 2" I.D. Sch. 5 type 316 stainless steel, threaded and flush jointed, 0.010" wire wrap screen, 0.25' welded bottom cap.

CENTRALIZERS Type 304 stainless steel
 4.84' - 6.01'

FILTER MATERIAL 32-42 silica sand
 3.00' - 8.00'

CEMENT Portland Type I
 0.00' - 2.00'

OTHER 3/8" Bentonite Pellets
 2.00' - 3.00'
 8.00' - 10.50'

CONSTRUCTION TIME LOG:

| TASK | START | | FINISH | |
|---------------------------|--------------|------|--------------|------|
| | DATE 1986 | TIME | DATE 1986 | TIME |
| DRILLING: 7 1/2" auger | 8/21 | 0937 | 8/21 | 1023 |
| GEOPHYS. LOGGING: | — | — | — | — |
| CASING: 2" stainless | 8/26 | 0836 | 8/26 | 0837 |
| FILTER PLACEMENT: | 8/26 | 0837 | 8/26 | 0840 |
| CEMENTING: | 8/26 | 0842 | 8/26 | 0846 |
| DEVELOPMENT: | 9/3 | 1015 | 9/3 | 1015 |
| OTHER: Bentonite | 8/26 | 0840 | 8/26 | 0842 |
| | 8/26 | 0834 | 8/26 | 0836 |

WELL DEVELOPMENT

See Well Development Summary Sheet.

COMMENTS:

No water encountered during drilling.

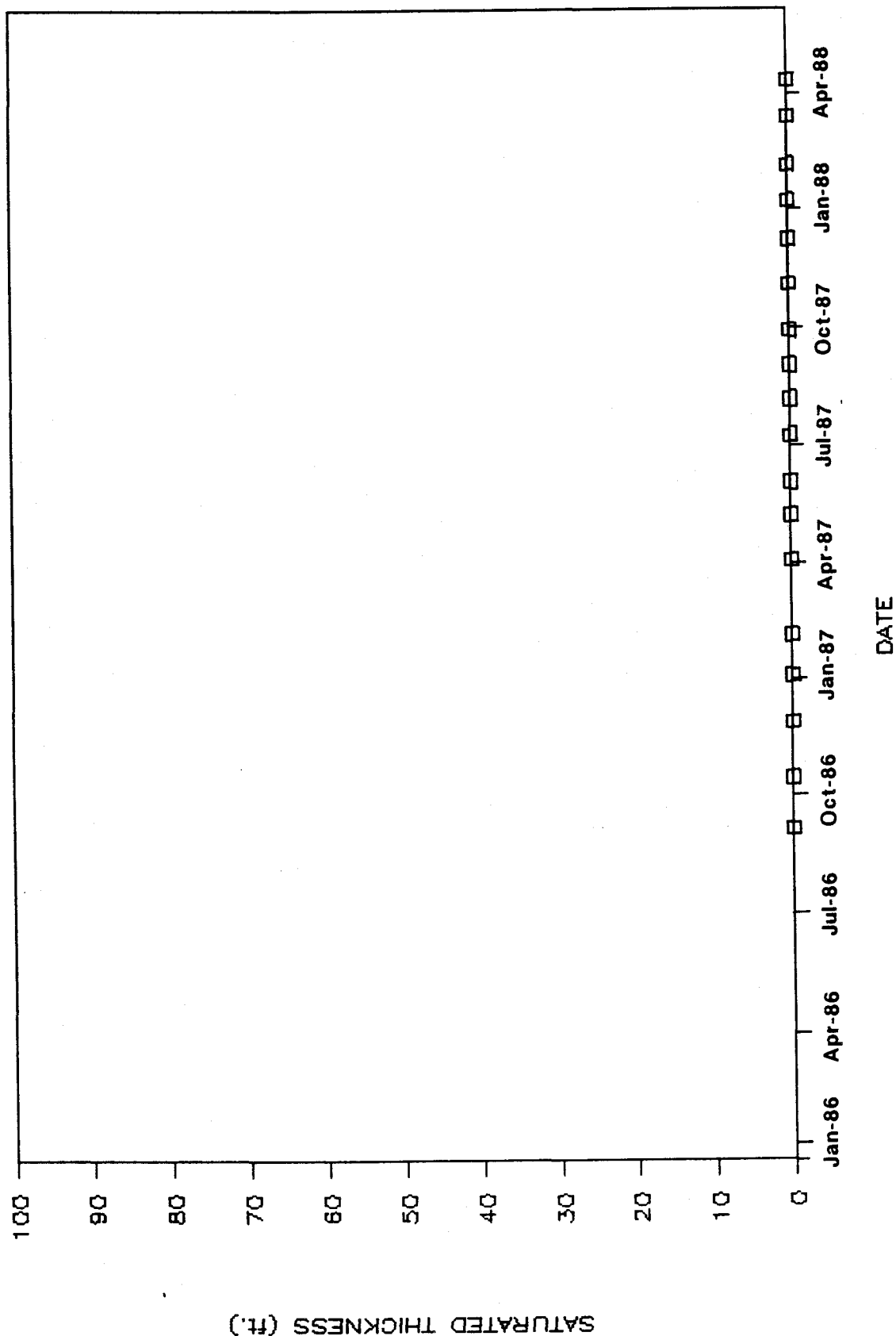
Top of stainless steel casing: 2.67'

ROCKY FLATS SOLAR PONDS

WATER LEVEL SUMMARY

| <u>WELL NUMBER</u> | <u>DATE</u> | <u>GROUND SURFACE ELEVATION</u> | <u>TOP OF CASING ELEVATION</u> | <u>STICK UP</u> | <u>DEPTH OF SI BASE</u> | <u>WATER DEPTH BELOW TOC</u> | <u>WATER SURFACE ELEVATION</u> |
|------------------------|-------------|---|--|---------------------|---------------------------------|--------------------------------------|--|
| 1886 | 09/03/86 | 5882.82 | 5885.49 | 2.67 | 7.50 | -1.00 | DRY |
| | 10/13/86 | | | | | -1.00 | DRY |
| | 11/26/86 | | | | | -1.00 | DRY |
| | 01/01/87 | | | | | -1.00 | DRY |
| | 02/01/87 | | | | | -1.00 | DRY |
| | 04/01/87 | | | | | -1.00 | DRY |
| | 05/06/87 | | | | | -1.00 | DRY |
| | 06/01/87 | | | | | -1.00 | DRY |
| | 07/08/87 | | | | | -1.00 | DRY |
| | 08/06/87 | | | | | -1.00 | DRY |
| | 09/01/87 | | | | | -1.00 | DRY |
| | 09/28/87 | | | | | -1.00 | DRY |
| | 11/03/87 | | | | | -1.00 | DRY |
| | 12/08/87 | | | | | -1.00 | DRY |
| | 01/07/88 | | | | | -1.00 | DRY |
| | 02/04/88 | | | | | -1.00 | DRY |
| | 03/14/88 | | | | | -1.00 | DRY |
| | 04/11/88 | | | | | -1.00 | DRY |

SATURATED THICKNESS IN WELL # 18-86(SP)



INDEX OF DATA

Boring No.: 20-86

Completed as well? Yes

Data in File

- ☒ Log of Borehole
- ☒ Well Construction Summaries
- ☐ Well Development Summaries
- ☐ Hydraulic Conductivity Test Data and Results
- ☐ Packer Test Data and Results
- ☒ Water Level Data
- ☒ Saturated Thickness Hydrographs

Project: Rocky Flats Plant

LOG OF BORING NO. 20-86

Date Drilled 9/4/86

Coordinates N 38110.3 E 21253.7

Boring Method Hollow Stem Auger

Ground Surface Elevation 5960.47

| Elev. (feet) | Depth (feet) | Sample Type | Graphic Log | Material Description | Penetration Resistance (Blows/Inch) | | Water Content (%) | | Other Tests |
|-----------------|-----------------|----------------|----------------|--|---|----|-------------------------|----|----------------|
| | | | | | 20 | 40 | 20 | 40 | |
| | 0 | | | ARTIFICIAL FILL 0-2.0'-Sample. Recovered 1.7/2.0'=85%. SAND: grayish orange (10YR 7/4) to dark yellowish orange (10YR 6/6) fine- to coarse grained sand; some granitic pebbles and cobbles; fragments of medium gray (N 5) claystone; no apparent bedding; poorly sorted; unconsolidated; dry. | | | | | |
| | 5 | | | 2.0-4.0'-Sample. Recovered 2.0/2.0'=100%. GRAVEL: dark yellowish orange (10YR 6/6) granite and quartzite pebbles and cobbles; some very fine-grained sand; slightly calcareous; no bedding evident; poorly sorted; unconsolidated; dry. | | | | | |
| | 10 | | | 4.0-6.5'-Sample. Recovered 0.3/2.5'=12%. GRAVEL: dark yellowish orange (10YR 6/6) granitic pebbles and cobbles; some fine-grained sand; poorly sorted; unconsolidated; dry. | | | | | |
| | 15 | | | 6.5-7.5'-Sample. Recovered 0/1.0'=0%. BOULDER: drilled out large quartzite boulder. | | | | | |
| | | | | 7.5-12.5'-Sample. Recovered 0.1/5.0'=2%. 7.5-10.0'-Cuttings. CEMENT RUBBLE; dry. | | | | | |
| | | | | ARAPAHOE FORMATION 12.5-17.5'-Sample. Recovered 5.0/5.0'=100%. 12.5-14.8'. CLAYSTONE: dark yellowish orange (10YR 6/6); silty; damp. | | | | | |
| | 20 | | | | | | | | |

Remarks Logged by: T. Murphy

Checked by: *[Signature]*

Project No.
106P06222

Hydro-Search, Inc.

Page 1 of 2

Project: Rocky Flats Plant

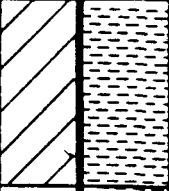
LOG OF BORING NO. 20-86

Date Drilled 9/4/86

Coordinates N 38110.3 E 21253.7


Boring Method Hollow Stem Auger

Ground Surface Elevation 5960.47

| Elev. (feet) | Depth (feet) | Sample Type | Graphic Log | Material Description | Penetration Resistance (Blows/Inch) | | Water Content (%) | | Other Tests |
|-----------------|-----------------|----------------|---|---|---|----|-------------------------|----|----------------|
| | | | | | 20 | 40 | 20 | 40 | |
| | 20 | |  | 14.8-17.5'. CLAYSTONE: greenish gray (5GY 6/1) to dark gray (N 3); some black (N 1) organic fragments; interbedded sand layers consisting of medium to fine-grained sand and silty sand. well sorted; damp. | | | | | |
| | 25 | | | 17.5-22.5'-Sample. Recovered 4.5/4.5'=100%. CLAYSTONE: medium brownish gray (5YR 4/4) to olive gray (5Y 4/1); silty; firm; damp. | | | | | |
| | | | | TOTAL DEPTH: 22.5' | | | | | |
| | 30 | | | | | | | | |
| | 35 | | | | | | | | |
| | 40 | | | | | | | | |

Remarks

Logged by: T. Murphy

Checked by: 

Project No.

106P06222

Hydro-Search, Inc.

Page 2 of 2

WELL CONSTRUCTION SUMMARY

 LOCATION or COORDS: _____
 N 38110.3 E 21253.7

 ELEVATION: GROUND LEVEL 5960.47'
 TOP OF CASING 5962.12'

DRILLING SUMMARY:

 TOTAL DEPTH Well: 10.55' Hole: 22.00'
 BOREHOLE DIAMETER 7 1/2"
 DRILLER Boyles Brothers Drilling Co.
 15865 W. 5th Avenue
 Golden, CO (Dave Jarvie)
 RIG Mobile B-57
 BIT(S) Clay bit
 DRILLING FLUID None
 SURFACE CASING 5" x 4' steel w/ locking cap

WELL DESIGN:

 BASIS: GEOLOGIC LOG X GEOPHYSICAL LOG _____
 CASING STRING(S): C=CASING S=SCREEN

| | | | |
|-------|--------|-------|-------|
| 0.00' | 4.21' | C1 | _____ |
| 4.21' | 10.55' | S1 | _____ |
| _____ | _____ | _____ | _____ |
| _____ | _____ | _____ | _____ |
| _____ | _____ | _____ | _____ |
| _____ | _____ | _____ | _____ |
| _____ | _____ | _____ | _____ |
| _____ | _____ | _____ | _____ |
| _____ | _____ | _____ | _____ |

CASING: C1 2" I.D. Sch. 5 type 316 stainless steel, threaded and flush jointed.

SCREEN: S1 2" I.D. Sch. 5 type 316 stainless steel, threaded and flush jointed, 0.010" wire wrap screen 0.25" welded bottom cap.

 CENTRALIZERS Type 304 stainless steel
 6.62' - 7.77'

 FILTER MATERIAL 32-42 silica sand
 3.00' - 11.00'

 CEMENT Portland Type I
 0.00' - 2.00'

 OTHER 3/8" bentonite pellets
 2.00' - 3.00'
 19.20' - 11.00'

CONSTRUCTION TIME LOG:

| TASK | START | | FINISH | |
|---------------------------|--------------|------|--------------|------|
| | DATE 1986 | TIME | DATE 1986 | TIME |
| DRILLING: 7 1/2" auger | 9/4 | 1429 | 9/4 | 1530 |
| GEOPHYS. LOGGING: | — | — | — | — |
| CASING: 2" stainless | 9/4 | 1722 | 9/4 | 1724 |
| FILTER PLACEMENT | 9/4 | 1724 | 9/4 | 1730 |
| CEMENTING: | 9/5 | 1020 | 9/5 | 1033 |
| DEVELOPMENT: | 9/12 | 1307 | 9/12 | 1307 |
| OTHER: Bentonite | 9/4 | 1730 | 9/4 | 1731 |
| | 9/4 | 1715 | 9/4 | 1720 |

WELL DEVELOPMENT

See Well Development Summary Sheet.

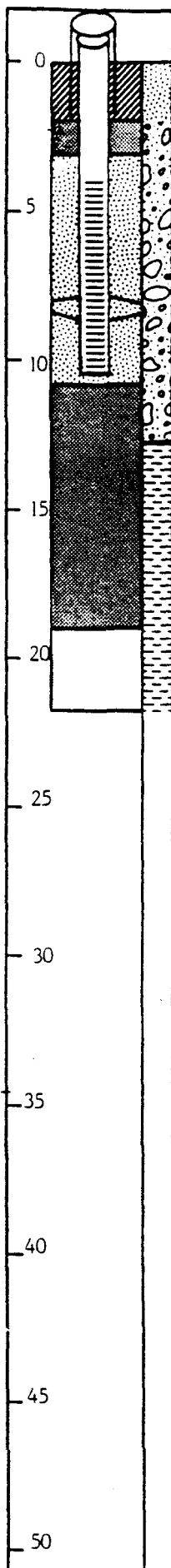
COMMENTS:

No water encountered during drilling.

Top of stainless steel casing: 1.65'

Cave from TD to 19.20'

 LOCATION Golden, CO
 PERSONNEL T. Murphy

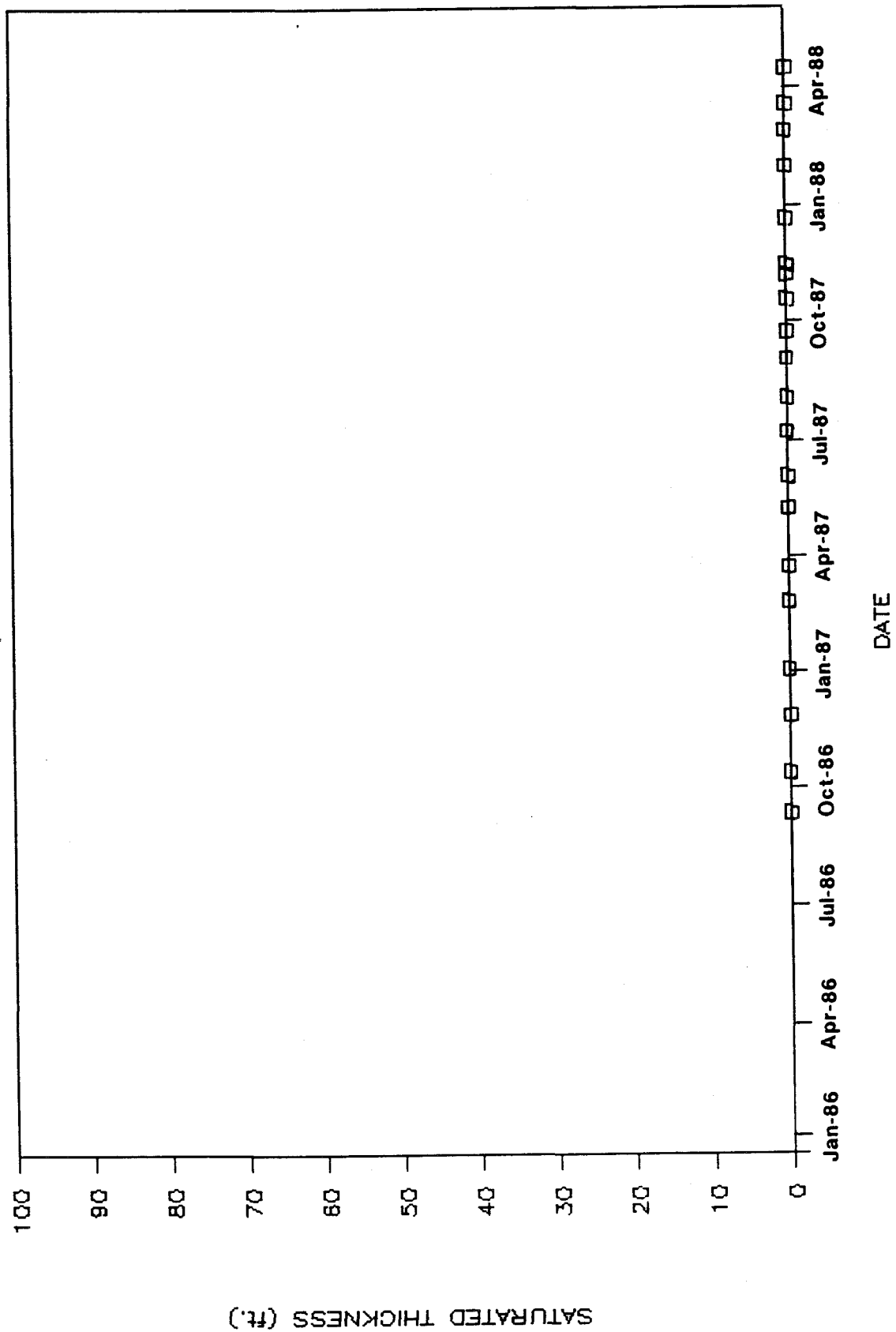
 PROJECT 106P06222
 Rocky Flats Plant


ROCKY FLATS SOLAR PONDS

WATER LEVEL SUMMARY

| <u>WELL</u> <u>NUMBER</u> | <u>DATE</u> | <u>GROUND</u> <u>SURFACE</u> <u>ELEVATION</u> | <u>TOP OF</u> <u>CASING</u> <u>ELEVATION</u> | <u>STICK</u> <u>UP</u> | <u>DEPTH</u> <u>OF SI</u> <u>BASE</u> | <u>WATER</u> <u>DEPTH</u> <u>BELOW TOC</u> | <u>WATER</u> <u>SURFACE</u> <u>ELEVATION</u> |
|------------------------------|-------------|---|--|---------------------------|---|--|--|
| 2086 | 09/12/86 | 5960.47 | 5962.12 | 1.65 | 10.55 | -1.00 | DRY |
| | 10/13/86 | | | | | -1.00 | DRY |
| | 11/26/86 | | | | | -1.00 | DRY |
| | 01/01/87 | | | | | -1.00 | DRY |
| | 02/25/87 | | | | | -1.00 | DRY |
| | 03/24/87 | | | | | -1.00 | DRY |
| | 05/08/87 | | | | | -1.00 | DRY |
| | 06/03/87 | | | | | -1.00 | DRY |
| | 07/08/87 | | | | | 11.80 | 5950.32 |
| | 08/04/87 | | | | | 12.00 | 5950.12 |
| | 09/03/87 | | | | | -1.00 | DRY |
| | 09/24/87 | | | | | -1.00 | DRY |
| | 10/21/87 | | | | | -1.00 | DRY |
| | 11/09/87 | | | | | -1.00 | DRY |
| | 11/17/87 | | | | | -1.00 | DRY |
| | 12/22/87 | | | | | -1.00 | DRY |
| | 02/01/88 | | | | | -1.00 | DRY |
| | 02/29/88 | | | | | -1.00 | DRY |
| | 03/21/88 | | | | | -1.00 | DRY |
| | 04/18/88 | | | | | -1.00 | DRY |

SATURATED THICKNESS IN WELL # 20-86(SP)



INDEX OF DATA

Boring No.: 22-86

Completed as well? Yes

Data in File

- ☒ Log of Borehole
- ☒ Well Construction Summaries
- ☐ Well Development Summaries
- ☒ Hydraulic Conductivity Test Data
and Results
- ☐ Packer Test Data and Results
- ☒ Water Level Data
- ☒ Saturated Thickness Hydrographs

| | | | | | | | |
|----------------------------------|--|--|--|----------------------------------|--|--|--|
| Project: Rocky Flats Plant | | | | LOG OF BORING NO. 22-86 | | | |
| Date Drilled 9/8/86 | | | | Coordinates N 37734.9 E 21307.7 | | | |
| Boring Method: Hollow Stem Auger | | | | Ground Surface Elevation 5976.81 | | | |

| Elev. (feet) | Depth (feet) | Sample Type | Graphic Log | Material Description | Penetration Resistance (Blows/Inch) 20 40 | Water Content (%) 20 40 | Other Tests |
|-----------------|-----------------|-------------|-------------|--|---|-------------------------------|-------------|
| | 0 | | | <p style="text-align: center;">ROCKY FLATS ALLUVIUM</p> <p>0-3.0'-Sample. Recovered 1.3/3.0'=43%. CLAY: grayish brown (5YR 3/2) to dusky brown (5YR 3/2); some quartzite pebbles; poorly sorted; soft; unconsolidated; wet.</p> | | | |
| | 2.5 | | | <p>3.0-5.0'-Sample. Recovered 2.0/2.0'=100%. GRAVEL: dark reddish brown (10YR 3/4) to grayish olive (10Y 4/2) granite and quartzite pebbles and cobbles; some sand, silt and clay; poorly sorted; unconsolidated; wet.</p> | | | |
| | 5 | | | <p>5.0-7.0'-Sample. Recovered 1.3/2.0'=65%. GRAVEL: pale olive (10Y 3/2) granitic pebbles and coarse to fine-grained sand; silty; trace clay; poorly sorted; calcareous; damp.</p> | | ▽ | |
| | 7.5 | | | <p>7.0-10.0'-Sample. Recovered 0.6/3.0'=20%. GRAVEL: pale olive (10Y 3/2) granitic pebbles and cobbles; some coarse to fine-grained sand and silt; trace clay; poorly sorted; angular; damp.</p> | | | |
| | 10 | | | | | | |

| | | |
|----------------|----------------------|--------------------------------|
| Remarks | Logged by: T. Murphy | Checked by: <i>[Signature]</i> |
|----------------|----------------------|--------------------------------|

| | | |
|--------------------------|---------------------------|-------------|
| Project No. 106P06222 | Hydro-Search, Inc. | Page 1 of 3 |
|--------------------------|---------------------------|-------------|

Project: Rocky Flats Plant


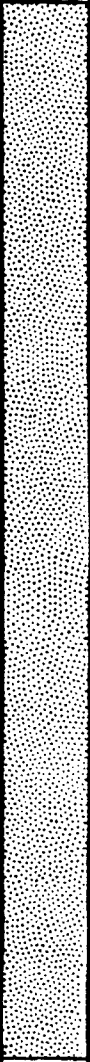
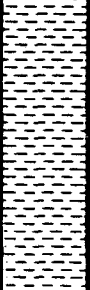
LOG OF BORING NO. 22-86

Date Drilled 9/8/86

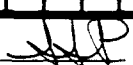
Coordinates N 37734.9 E 21307.7

Boring Method: Hollow Stem Auger

Ground Surface Elevation 5976.81

| Elev. (feet) | Depth (feet) | Sample Type | Graphic Log | Material Description | Penetration Resistance (Blows/Inch) | | Water Content (%) | | Other Tests |
|-----------------|-----------------|----------------|---|--|---|----|-------------------------|----|----------------|
| | | | | | 20 | 40 | 20 | 40 | |
| | 10 | |  | 10.0-12.0'-Sample. Recovered 2.0/2.0'=100%. 10.0-11.0'. GRAVEL: Same as above; wet. | | | ▼ | | |
| | 12.5 | |  | ARAPAHOE FORMATION 11.0-12.0'. SANDSTONE: medium light gray (N 6); medium to fine-grained silty sand with some clay; few dark yellowish orange (10YR 6/6) iron staining; moderately sorted; firm; moist. 12.0-14.0'-Sample. Recovered 2.0/2.0'=100%. SANDSTONE: medium light gray (N 6); medium to fine-grained sand and silty sand; increased iron staining; clayey layers at 12.9 and 13.4'; well sorted; firm; moist. 14.0-16.0'-Sample. Recovered 2.0/2.0'=100%. SANDSTONE: medium light gray (N 6); medium to fine-grained sand and silty sandstone with interbedded claystone; increase in clay content; slightly calcareous fractures at 14.4'; moderately sorted; firm; moist. 16.0-18.0'-Sample. Recovered 2.0/2.0'=100%. SANDSTONE: medium light gray (N 6) interbedded sandstone and claystone; increase in dark yellowish orange iron staining (10YR 6/6); increase in clay content; moderately sorted; firm; moist. | | | | | |
| | 17.5 | |  | 18.0-19.0'-Sample. Recovered 1.0/1.0'=100%. CLAYSTONE: greenish gray (5GY 6/1) to medium light gray (N 6); with interbedded fine-grained, silty, clayey sand; firm; moist. | | | | | |
| | 20 | | | | | | | | |

Remarks Logged by: T. Murphy

Checked by: 

Project No.
106P06222

Hydro-Search, Inc.

Page 2 of 3

Project: Rocky Flats Plant

LOG OF BORING NO. 22-86

Date Drilled 9/8/86

Coordinates N 37734.9 E 21307.7

Boring Method Hollow Stem Auger

Ground Surface Elevation 5976.81

| Elev. (feet) | Depth (feet) | Sample Type | Graphic Log | Material Description | Penetration Resistance (Blows/Inch) | | Water Content (%) | | Other Tests |
|-----------------|-----------------|----------------|----------------|---|---|----|-------------------------|----|----------------|
| | | | | | 20 | 40 | 20 | 40 | |
| | 20 | | | 19.0-21.0'-Sample. Recovered 2.0/2.0'=100%. CLAYSTONE: Same as above; moist. | | | | | |
| | | | | 21.0-23.0'-Sample. Recovered 2.0/2.0'=100%. CLAYSTONE: dark gray (N 4) to greenish gray (5GY 6/1); with interbedded fine-grained, clayey sandstone; some iron staining; firm; moist. | | | | | |
| | 22.5 | | | 23.0-24.0'-Sample. Recovered 1.0/1.0'=100%. CLAYSTONE: dark gray (N 4) to greenish gray (5GY 6/1); with minor interbedded fine-grained sandstone; firm; moist. | | | | | |
| | | | | 24.0-26.0'-Sample. Recovered 2.0/2.0'=100%. CLAYSTONE: dark gray (N 4) to greenish gray (5GY 6/1); with interbedded fine-grained medium to dark gray (N 5 to N 6) sandstone; firm; damp. | | | | | |
| | 25 | | | | | | | | |
| | | | | TOTAL DEPTH: 26.0' | | | | | |
| | | | | | | | | | |
| | 27.5 | | | | | | | | |
| | | | | | | | | | |
| | 30 | | | | | | | | |

Remarks

Logged by: T. Murphy

Checked by:

Project No.

106P06222

Hydro-Search, Inc.

Page 3 of 3

WELL CONSTRUCTION SUMMARY

LOCATION or COORDS: _____
N 37734.9 E 21307.7

ELEVATION: GROUND LEVEL 5976.81'
TOP OF CASING 5978.05'

DRILLING SUMMARY:

TOTAL DEPTH Well: 11.20' Hole: 26.00'
BOREHOLE DIAMETER 7 1/2"
DRILLER Boyles Brothers Drilling Co.
15865 W. 5th Avenue
Golden, CO (Dave Jarvie)
RIG Mobile B-57
BIT(S) T5
DRILLING FLUID None
SURFACE CASING 5" x 4' steel w/ locking

WELL DESIGN:

BASIS: GEOLOGIC LOG X GEOPHYSICAL LOG _____

CASING STRING(S): C=CASING S=SCREEN

| 0.00' | 3.20' | C1 | | | |
|-------|--------|----|--|--|--|
| 3.20' | 11.20' | S1 | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

CASING: C1 2" I.D. Sch. 5 type 316 stainless steel, threaded and flush jointed.

SCREEN: S1 2" I.D. Sch. 5 type 316 stainless steel, threaded and flush jointed, 0.010" wire wrap screen, 0.25' welded bottom cap.

CENTRALIZERS Type 304 stainless steel
6.10' - 7.35'

FILTER MATERIAL 32-42 silica sand
2.50' - 11.40'

CEMENT Portland Type I
0.00' - 2.00'

OTHER 3/8" bentonite pellets
2.00' - 2.50'
11.40' - 22.60'

CONSTRUCTION TIME LOG:

| <u>TASK</u> | <u>START</u> | | <u>FINISH</u> | |
|---------------------|--------------|-------------|---------------|-------------|
| | <u>DATE</u> | <u>TIME</u> | <u>DATE</u> | <u>TIME</u> |
| DRILLING: | 1986 | | 1986 | |
| <u>7 1/2" auger</u> | <u>9/8</u> | <u>1000</u> | <u>9/8</u> | <u>1629</u> |
| _____ | _____ | _____ | _____ | _____ |
| _____ | _____ | _____ | _____ | _____ |
| GEOPHYS. LOGGING: | — | — | — | — |
| CASING: | | | | |
| <u>2" stainless</u> | <u>9/8</u> | <u>1734</u> | <u>9/8</u> | <u>1735</u> |
| _____ | _____ | _____ | _____ | _____ |
| _____ | _____ | _____ | _____ | _____ |
| FILTER PLACEMENT: | <u>9/8</u> | <u>1738</u> | <u>9/8</u> | <u>1742</u> |
| CEMENTING: | <u>9/8</u> | <u>1748</u> | <u>9/8</u> | <u>1800</u> |
| DEVELOPMENT: | <u>9/12</u> | <u>1620</u> | <u>9/19</u> | <u>134</u> |
| OTHER: | | | | |
| <u>Bentonite</u> | <u>9/8</u> | <u>1742</u> | <u>9/8</u> | <u>1748</u> |
| _____ | <u>9/8</u> | <u>1723</u> | <u>9/8</u> | <u>1725</u> |
| _____ | _____ | _____ | _____ | _____ |
| _____ | _____ | _____ | _____ | _____ |
| _____ | _____ | _____ | _____ | _____ |

WELL DEVELOPMENT

See Well Development Summary Sheet.

COMMENTS:

Water encountered at 10.5' during drilling

Top of stainless steel casing: 1.24'

Cave from TD to 22.60'



SHEET ____ of ____

CLIENT/SUBJECT _____ W.O. NO. _____

TASK DESCRIPTION _____ TASK NO. _____

PREPARED BY _____ DEPT _____ DATE _____

MATH CHECK BY _____ DEPT _____ DATE _____

METHOD REV. BY JLP DEPT _____ DATE 6/21/88

APPROVED BY

DEPT _____ DATE _____

WELL 22-86

Hydraulic Conductivity (cm/sec) = 8.7×10^{-6}

Static Water Level (ft below G.L.) = 7.27'

Screened Interval (ft below G.L.) = 3.20-11.20'

3.20 - 11.00' Gravel

11.0 - 11.20' sandstone

Method of Analysis: (Bouwer, 1978).

12:01:59.68

BAIL DOWN - RECOVERY ANALYSIS FOR WELL 22-86

FRI 06-10-
1988

RAW DATA

WELL # 22-86

WELL DIAMETER= 7.25 INCHES

CASING DIAMETER= 2.00 INCHES

VOLUME OF WATER= .64 GALLONS *

LENGTH OF AQUIFER TESTED= 3.93 FEET

VALUE OF H0= 3.93 FEET

STATIC WATER LEVEL= 7.27 FEET

LENGTH OF SCREEN= 8.00 FEET

WATER TABLE TO BOTTOM OF WELL= 3.93 FEET

* Bailed well dry in 6 min.; 6.4 gal. = volume in casing
+ screen.

| TIME | WATER LEVEL (FEET) | TIME SINCE TEST BEGAN (MINUTES) |
|---------|-----------------------|------------------------------------|
| ----- | ----- | ----- |
| 0. 8.30 | 10.46 | 8.50 |
| 0. 9. 0 | 10.39 | 9.00 |
| 0. 9.30 | 10.17 | 9.50 |
| 0.10. 0 | 10.11 | 10.00 |
| 0.10.30 | 10.07 | 10.50 |
| 0.11. 0 | 9.93 | 11.00 |
| 0.11.30 | 9.81 | 11.50 |
| 0.12. 0 | 9.72 | 12.00 |
| 0.12.30 | 9.64 | 12.50 |
| 0.13. 0 | 9.52 | 13.00 |
| 0.14. 0 | 9.35 | 14.00 |
| 0.15. 0 | 9.17 | 15.00 |
| 0.16. 0 | 8.98 | 16.00 |
| 0.17. 0 | 8.85 | 17.00 |
| 0.18. 0 | 8.74 | 18.00 |
| 0.19. 0 | 8.49 | 19.00 |
| 0.20. 0 | 8.37 | 20.00 |
| 0.21. 0 | 8.20 | 21.00 |
| 0.22. 0 | 8.10 | 22.00 |
| 0.23. 0 | 8.02 | 23.00 |
| 0.24. 0 | 7.93 | 24.00 |
| 0.30. 0 | 7.92 | 30.00 |
| 0.40. 0 | 7.91 | 40.00 |
| 0.49. 0 | 7.85 | 49.00 |
| 0.54. 0 | 7.82 | 54.00 |
| 0.59. 0 | 7.80 | 59.00 |
| 1. 4. 0 | 7.78 | 64.00 |
| 1. 9. 0 | 7.74 | 69.00 |
| 1.21. 0 | 7.71 | 81.00 |
| 1.34. 0 | 7.69 | 94.00 |
| 1.44. 0 | 7.66 | 104.00 |
| 1.54. 0 | 7.63 | 114.00 |
| 2. 5. 0 | 7.61 | 125.00 |
| 2.14. 0 | 7.58 | 134.00 |
| 2.24. 0 | 7.54 | 144.00 |

12:02:03.91

BAIL DOWN - RECOVERY ANALYSIS FOR WELL 22-86

FRI 06-10-

WELL # 22-86

WELL DIAMETER= 7.25 INCHES

CASING DIAMETER= 2.00 INCHES

VOLUME OF WATER REMOVED OR ADDED TO WELL= .64 GALLONS

LENGTH OF AQUIFER TESTED= 3.93 FEET

VALUE OF H₀= 3.93 FEET

STATIC WATER LEVEL= 7.27 FEET

SLUG TEST DATA:

| TIME SINCE TEST BEGAN (MINUTES) | WATER LEVEL (FEET) | DRAWDOWN (FEET) | HEAD RATIO | RECIPROCAL TIME (1/MINUTES) |
|------------------------------------|-----------------------|--------------------|------------|--------------------------------|
| 8.50 | 10.46 | 3.19 | .812 | .118 |
| 9.00 | 10.39 | 3.12 | .794 | .111 |
| 9.50 | 10.17 | 2.90 | .738 | .105 |
| 10.00 | 10.11 | 2.84 | .723 | .100 |
| 10.50 | 10.07 | 2.80 | .712 | .095 |
| 11.00 | 9.93 | 2.66 | .677 | .091 |
| 11.50 | 9.81 | 2.54 | .646 | .087 |
| 12.00 | 9.72 | 2.45 | .623 | .083 |
| 12.50 | 9.64 | 2.37 | .603 | .080 |
| 13.00 | 9.52 | 2.25 | .573 | .077 |
| 14.00 | 9.35 | 2.08 | .529 | .071 |
| 15.00 | 9.17 | 1.90 | .483 | .067 |
| 16.00 | 8.98 | 1.71 | .435 | .063 |
| 17.00 | 8.85 | 1.58 | .402 | .059 |
| 18.00 | 8.74 | 1.47 | .374 | .056 |
| 19.00 | 8.49 | 1.22 | .310 | .053 |
| 20.00 | 8.37 | 1.10 | .280 | .050 |
| 21.00 | 8.20 | .93 | .237 | .048 |
| 22.00 | 8.10 | .83 | .211 | .045 |
| 23.00 | 8.02 | .75 | .191 | .043 |
| 24.00 | 7.93 | .66 | .168 | .042 |
| 30.00 | 7.92 | .65 | .165 | .033 |
| 40.00 | 7.91 | .64 | .163 | .025 |
| 49.00 | 7.85 | .58 | .148 | .020 |
| 54.00 | 7.82 | .55 | .140 | .019 |
| 59.00 | 7.80 | .53 | .135 | .017 |
| 64.00 | 7.78 | .51 | .130 | .016 |
| 69.00 | 7.74 | .47 | .120 | .014 |
| 81.00 | 7.71 | .44 | .112 | .012 |
| 94.00 | 7.69 | .42 | .107 | .011 |
| 104.00 | 7.66 | .39 | .099 | .010 |
| 114.00 | 7.63 | .36 | .092 | .009 |
| 125.00 | 7.61 | .34 | .087 | .008 |
| 134.00 | 7.58 | .31 | .079 | .007 |
| 144.00 | 7.54 | .27 | .069 | .007 |

12:02:08.46

BAIL DOWN - RECOVERY ANALYSIS FOR WELL 22-86

FRI 06-10-1988

WELL # 22-86

PERMEABILITY BASED ON COOPER, BREDEHOEFT, AND PAPADOPULOS METHOD

PERMEABILITY=8.98E-04/ MATCH TIME (IN MINUTES)
STORAGE COEF= 7.61E-02* ALPHA
COMPUTER CALCULATES
ALPHA=1.00E-05 MATCH TIME= 7.5
PERMEABILITY= 1.20E-04 CM/SEC
STORAGE COEF=7.61E-07
CORRELATION NUMBER= 1.00

PERMEABILITY BASED ON REGRESSION FIT OF HEAD RATIO DATA

HVORSLEV PERMEABILITY=1.15E-03 / LAG TIME
BOUWER PERMEABILITY=1.00E-03 * -SLOPE

COMPUTER CALCULATES

PERMEABILITY VARIES MORE THAN 20% DEPENDING ON THE EQUATION

FOR X ON Y: HVORSLEV PERMEABILITY=5.38E-05 CM/SEC
BOUWER PERMEABILITY=7.43E-06 CM/SEC
FOR Y ON X: HVORSLEV PERMEABILITY=4.32E-05 CM/SEC
BOUWER PERMEABILITY=9.94E-06 CM/SEC
AVERAGE HVORSLEV PERMEABILITY=4.79E-05 CM/SEC
AVERAGE BOUWER PERMEABILITY=8.69E-06 CM/SEC
REGRESSION STATISTICS

X ON Y

INTERCEPT= -.27

SLOPE=-7.40E-03

Y ON X

INTERCEPT= -.17

SLOPE=-9.90E-03

CORRELATION COEFFICIENT= -.86

CALCULATIONS INDICATE THAT A VALUE OF 6.72 FEET FOR H₀
OR A VALUE OF 1.529 INCHES FOR EFFECTIVE CASING DIA.
MAY YIELD BETTER RESULTS

PERMEABILITY BASED ON REGRESSION FIT OF DATA - FERRIS & KNOWLES METHOD

PERMEABILITY=8.79E-04 / SLOPE
PERMEABILITY=3.09E-05 CM/SEC
REGRESSION STATISTICS

X ON Y

INTERCEPT= -.03

SLOPE= 2.79E+01

Y ON X

INTERCEPT= -.08

SLOPE= 2.90E+01

CORRELATION COEFFICIENT= .98

12:05:27.40

BAIL DOWN - RECOVERY ANALYSIS FOR WELL 22-86

FRI 06-10-

| WELL # | PERMEABILITY METHOD 1 | PERMEABILITY METHOD 2 | STORAGE COEF METHOD 2 | PERMEABILITY METHOD 3 | PERMEABILITY METHOD 4 |
|--------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| 22-86 | 4.79E-05 | 1.20E-04 | 7.61E-07 | 3.09E-05 | 8.69E-06 |

* METHOD 1 IS HVORSLEV

METHOD 2 IS COOPER, BREDEHOEFT, AND PAPADOPULOS

METHOD 3 IS FERRIS AND KNOWLES

METHOD 4 IS BOUWER

AQUIFER TEST DATA

WELL 22-86
PUMPING or OBSERVATION WELL
PUMPING or RECOVERY DATA
PAGE 1 OF 2

TYPE OF AQUIFER TEST Rail down recovery
HOW Q MEASURED N/A (bailed)
HOW W.L.'s MEASURED OLYMPIC
RAD./DIST. OF/FROM PUMPING WELL 8
MEAS. POINT FOR W.L.'s Northside
ELEVATION OF MEAS. POINT 1178.7

DEPTH OF PUMP/AIRPIPE
PUMP ON: date 9/26 time
PUMP OFF: date time
DURATION OF AQUIFER TEST 136 min.

LOCATION Rocky Flats Plant, Garden, CO
PERSONNEL J. Paric M. Bergman

PROJECT 106P06 222

| TIME | | | | WATER LEVEL DATA | | | | | DISCHARGE | | RECORDED BY | COMMENTS |
|-----------------------|------------|------|-------|----------------------------|---------------------------|-------------|---------|-------|-----------|---|-------------|------------------------|
| t = 0858:00 at t' = 0 | | | | STATIC WATER LEVEL 5+3.52' | | | | | | | | |
| DAY | CLOCK TIME | t | t' | READING | CONVERSIONS & CORRECTIONS | WATER LEVEL | s or s' | | READING | Q | | |
| 1 | 0845 | | | 5+3.52 | -1.25' sv | 7.27 | | | | | | static |
| | 0852 | 0 | | | | | | | | | | Begin bailing |
| | 0856 | 6 | | | | | | 5' | ~325 | | | Bailed dry |
| | 0858 | 8 | 0 | 10+1.78 | " | 10.53 | -0.07 | -3.26 | | | 9D | Began recovery 0858:00 |
| | 130 | | 1:30 | 10+1.71 | " | 10.46 | -0.07 | -3.19 | | | | |
| | 0859 | | 1:00 | 10+1.64 | " | 10.39 | -0.22 | -3.12 | | | | |
| | 1:30 | | 1:38 | 10+1.47 | " | 10.17 | -0.86 | -2.90 | | | | |
| | 0900 | | 2:00 | 10+1.36 | " | 10.11 | -0.04 | -2.84 | | | | |
| | 1:30 | | 2:30 | 10+1.32 | " | 10.07 | -0.14 | -2.80 | | | | |
| | 0901 | | 3:00 | 10+1.18 | " | 9.93 | -0.12 | -2.66 | | | | |
| | 1:50 | | 3:30 | 10+1.06 | " | 9.81 | -0.09 | -2.54 | | | | |
| | 0902 | | 4:00 | 10+0.97 | " | 9.72 | -0.08 | -2.45 | | | | |
| | 1:30 | | 4:30 | 10+0.89 | " | 9.64 | -0.12 | -2.37 | | | | |
| | 0903 | | 5:00 | 10+0.77 | " | 9.52 | -0.17 | -2.25 | | | | |
| | 0904 | | 6:00 | 10+0.60 | " | 9.35 | -0.18 | -2.08 | | | | |
| | 0905 | | 7:00 | 10+0.42 | " | 9.17 | -0.19 | -1.90 | | | | |
| | 0906 | | 8:00 | 10+0.23 | " | 8.98 | -0.13 | -1.71 | | | | |
| | 0907 | | 9:00 | 10+0.16 | " | 8.85 | -0.11 | -1.58 | | | | |
| | 0908 | | 10:00 | 5+4.99 | " | 8.74 | -0.25 | -1.47 | | | | |
| | 0909 | | 11:00 | 5+4.74 | " | 8.49 | -0.12 | -1.22 | | | | |
| | 0910 | | 12:00 | 5+4.62 | " | 8.37 | -0.17 | -1.10 | | | | |
| | 0911 | | 13:00 | 5+4.45 | " | 8.20 | -0.10 | -0.93 | | | | |
| | 0912 | | 14:00 | 5+4.35 | " | 8.10 | -0.08 | -0.83 | | | | |
| | 0913 | | 15:00 | 5+4.27 | " | 8.02 | -0.09 | -0.75 | | | | |
| | 0914 | | 16:00 | 5+4.18 | " | 7.93 | -0.00 | -0.66 | | | | |
| | 0916 | | 18:00 | 5+4.18 | " | 7.93 | -0.00 | -0.66 | | | | |
| | 0918 | | 20:00 | 5+4.18 | " | 7.93 | -0.01 | -0.66 | | | | |
| | 0920 | | 22:00 | 5+4.17 | " | 7.92 | -0.00 | -0.65 | | | | |
| | 0922 | | 24:00 | 5+4.17 | " | 7.92 | -0.00 | -0.65 | | | | |
| | 0924 | | 26:00 | 5+4.17 | " | 7.92 | -0.00 | -0.65 | | | | |
| | 0926 | | 28:00 | 5+4.17 | " | 7.92 | -0.00 | -0.65 | | | | |
| | 0928 | | 30:00 | 5+4.17 | " | 7.92 | -0.01 | -0.65 | | | | |
| | 0930 | | 32:00 | 5+4.16 | " | 7.91 | +0.01 | -0.64 | | | | |
| | 0932 | | 34:00 | 5+4.17 | " | 7.92 | -0.00 | -0.65 | | | | |
| | 0934 | | 36:00 | 5+4.17 | " | 7.92 | -0.07 | -0.65 | | | | |
| | 0939 | | 41:00 | 5+4.10 | " | 7.85 | -0.03 | -0.58 | | | | |
| | 0942 | | 46:00 | 5+4.07 | " | 7.82 | -0.02 | -0.55 | | | | |
| | 0949 | | 51:00 | 5+4.05 | " | 7.80 | -0.02 | -0.53 | | | | |
| | 0954 | | 56:00 | 5+4.03 | " | 7.78 | -0.04 | -0.51 | | | | |
| | 0959 | | 61:00 | 5+3.99 | " | 7.74 | -0.00 | -0.47 | | | | |
| 1 | 1005 | 7300 | 61:00 | 5+3.99 | -1.25' sv | 7.74 | -0.03 | -0.47 | | | 9D | Gain 1 min. |

LOCATION Ricky Flats-Plant, Golden Co.
 PERSONNEL L. Bruce M. August 97

PROJECT 106 P06222

AQUIFER TEST DATA

TYPE OF AQUIFER TEST Rail down - Recovery
 HOW Q MEASURED N/A
 HOW W.L.'s MEASURED ALTIMETER
 RAD./DIST. OF/FROM PUMPING WELL 52
 MEAS. POINT FOR W.L.'s northeast 2" stainless steel
 ELEVATION OF MEAS. POINT 7

WELL 22-86
 PUMPING or OBSERVATION WELL
 PUMPING or RECOVERY DATA
 PAGE 2 OF 2

DEPTH OF PUMP/AIRPIPE
 PUMP ON: date N/A time 2:12
 PUMP OFF: date 8/12 time 2:12
 DURATION OF AQUIFER TEST 136 min

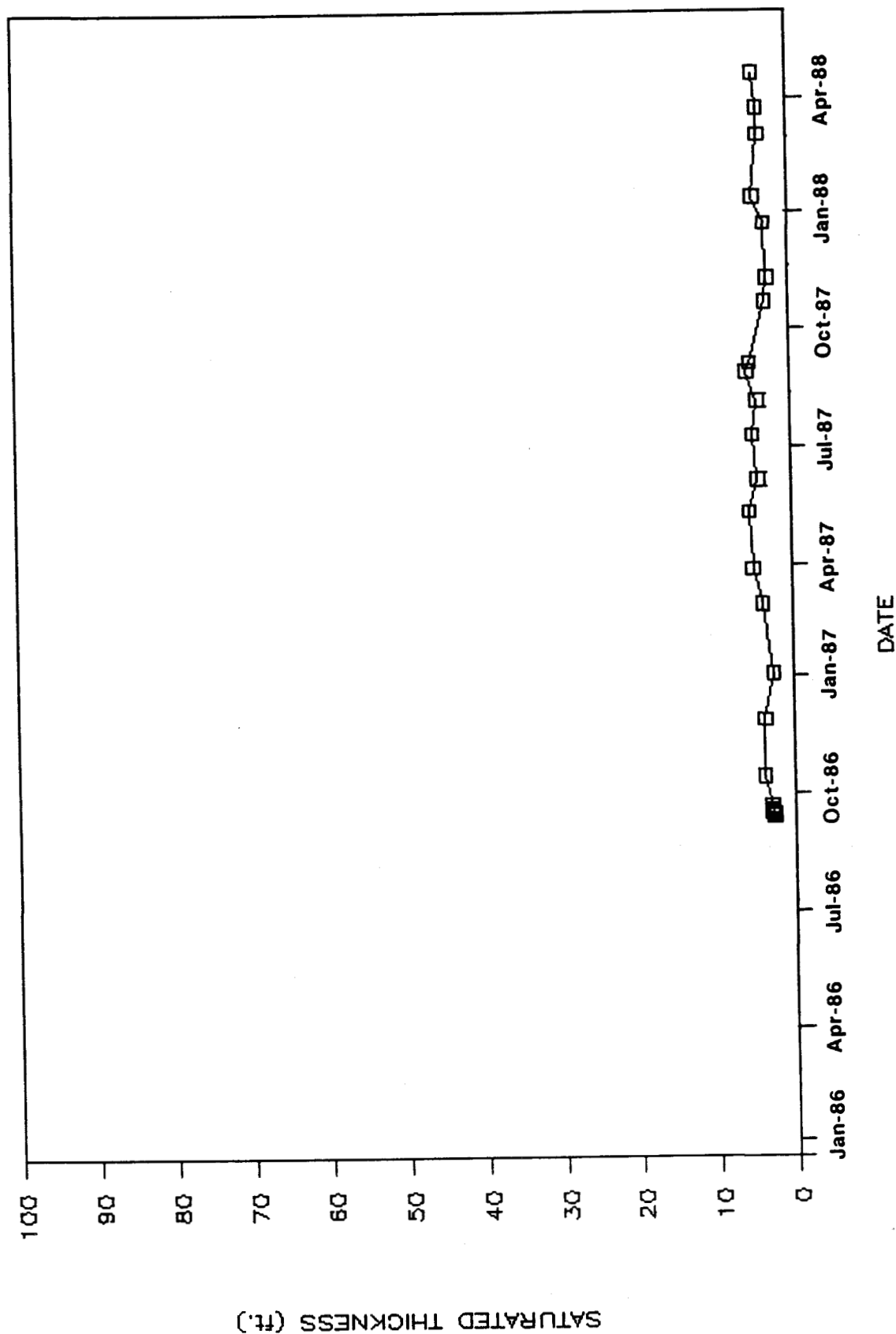
| TIME | | | | WATER LEVEL DATA | | | | | DISCHARGE | | RECORDED BY | COMMENTS |
|---------------------|------------|---|--------|--------------------------|----------------------------|----------------|---------|-------|--------------|---|-------------|-----------------|
| t = _____ at t' = 0 | | | | STATIC WATER LEVEL _____ | | | | | _____ | | | |
| DAY | CLOCK TIME | t | t' | READING | CONVERSIONS CORRECTIONS | WATER LEVEL | s or s' | | READ- ING | Q | | |
| 1 | 1017 | | 73:05 | 5+3.96 | -1.25 in. | 7.71 | 0.00 | -0.44 | | | 8P | Gain / min. |
| | 1018 | | 76:00 | 5+3.96 | | 7.71 | 0.00 | -0.44 | | | | |
| | 1019 | | 81:00 | 5+3.96 | | 7.71 | -0.02 | -0.44 | | | | |
| | 1024 | | 86:00 | 5+3.94 | | 7.69 | -0.03 | -0.42 | | | | |
| | 1034 | | 96:00 | 5+3.91 | | 7.66 | -0.03 | -0.39 | | | | 10 min interval |
| | 1044 | | 106:00 | 5+3.88 | | 7.63 | -0.02 | -0.36 | | | | |
| | 1055 | | 117:00 | 5+3.86 | | 7.61 | -0.03 | -0.34 | | | | |
| | 1104 | | 126:00 | 5+3.83 | | 7.58 | -0.04 | 0.31 | | | | 90% Recovery |
| | 1114 | | 136:00 | 5+3.79 | -1.25 in. | 7.54 | -0. | 0.27 | | | 9P | |
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ROCKY FLATS SOLAR PONDS

WATER LEVEL SUMMARY

| <u>WELL</u> <u>NUMBER</u> | <u>DATE</u> | <u>GROUND</u> <u>SURFACE</u> <u>ELEVATION</u> | <u>TOP OF</u> <u>CASING</u> <u>ELEVATION</u> | <u>STICK</u> <u>UP</u> | <u>DEPTH</u> <u>OF SI</u> <u>BASE</u> | <u>WATER</u> <u>DEPTH</u> <u>BELOW TOC</u> | <u>WATER</u> <u>SURFACE</u> <u>ELEVATION</u> |
|------------------------------|-------------|---|--|---------------------------|---|--|--|
| 2286 | 09/12/86 | 5976.81 | 5978.05 | 1.24 | 11.20 | 8.38 | 5969.67 |
| | 09/13/86 | | | | | 8.52 | 5969.53 |
| | 09/15/86 | | | | | 8.25 | 5969.80 |
| | 09/16/86 | | | | | 8.22 | 5969.83 |
| | 09/17/86 | | | | | 8.28 | 5969.77 |
| | 09/19/86 | | | | | 8.22 | 5969.83 |
| | 10/13/86 | | | | | 7.22 | 5970.83 |
| | 11/26/86 | | | | | 7.35 | 5970.70 |
| | 01/01/87 | | | | | 8.50 | 5969.55 |
| | 02/25/87 | | | | | 7.29 | 5970.76 |
| | 03/24/87 | | | | | 6.17 | 5971.88 |
| | 05/08/87 | | | | | 5.71 | 5972.34 |
| | 06/03/87 | | | | | 6.80 | 5971.25 |
| | 07/08/87 | | | | | 6.25 | 5971.80 |
| | 08/04/87 | | | | | 6.80 | 5971.25 |
| | 08/27/87 | | | | | 5.60 | 5972.45 |
| | 09/03/87 | | | | | 5.90 | 5972.15 |
| | 10/21/87 | | | | | 8.00 | 5970.05 |
| | 11/09/87 | | | | | 8.40 | 5969.65 |
| | 12/21/87 | | | | | 8.00 | 5970.05 |
| | 01/11/88 | | | | | 6.60 | 5971.45 |
| | 02/29/88 | | | | | 7.30 | 5970.75 |
| | 03/21/88 | | | | | 7.20 | 5970.85 |
| | 04/18/88 | | | | | 6.70 | 5971.35 |

SATURATED THICKNESS IN WELL # 22-86 (SP)



INDEX OF DATA

Boring No.: 23-86

Completed as well? Yes

Data in File

- X Log of Borehole
- X Well Construction Summaries
- Well Development Summaries
- X Hydraulic Conductivity Test Data
and Results
- X Packer Test Data and Results
- X Water Level Data
- X Saturated Thickness Hydrographs

Project: Rocky Flats Plant

LOG OF BORING NO. 23-86

Date Drilled 9/11/86, 9/19/86, 9/22/86, 9/23/86 Coordinates N 37355.0 E 21154.4

Boring Method Hollow Stem Auger/NC core Ground Surface Elevation 5981.18

| Elev. (feet) | Depth (feet) | Sample Type | Graphic Log | Material Description | Penetration Resistance (Blows/Inch) | | Water Content (%) | | Other Tests |
|-----------------|-----------------|----------------|----------------|---|---|----|-------------------------|----|----------------|
| | | | | | 20 | 40 | 20 | 40 | |
| | 0 | | | ARTIFICIAL FILL | | | | | |
| | | | | 0-2.5'-Sample. Recovered 1.5/2.5'=60%. Pale GRAVEL: reddish brown (10R 5/4) to light olive gray (5Y 5/2) sand, silt and pebbles; some quartzite cobbles; calcareous; poorly sorted; angular; unconsolidated; dry. | | | | | |
| | | | | 2.5-5.0'-Sample. Recovered 1.2/2.5'=48%. GRAVEL: yellowish gray (5Y 8/4) sand, silt and pebbles; calcareous; poorly sorted; angular; damp. | | | | | |
| | 5 | | | 5.0-7.0'-Sample. Recovered 0.7/2.0'=35%. GRAVEL: pale olive (10Y 6/2) granite and quartzite pebbles; some sand; trace clay and silt; calcareous; poorly sorted; compacted; damp. | | | | | |
| | | | | 7.0-9.5'-Sample. Recovered 1.7/2.5'=68%. | | | | | |
| | 10 | | | 7.0-8.2'. GRAVEL: Same as above; damp. | | | | | |
| | | | | ARAPAHOE FORMATION | | | | | |
| | | | | 8.2-9.5'. CLAYSTONE: pale olive (10Y 6/2); silty; calcite along fractures at 8.5', 9.0', and 9.5'; some dark yellowish orange (10YR 6/6) staining; firm; damp. | | | | | |
| | | | | 9.5-12.0'-Sample. Recovered 2.5/2.5'=100%. CLAYSTONE: yellowish gray to greenish gray (5Y 7/2 to 5GY 6/1); sandy and silty in upper 1.5' increasing in clay content with depth; some dark yellowish orange (10YR 6/6) iron staining; ironstone at 10.5'; calcareous layers at 9.5' and 10.7'; firm; damp. | | | | | |
| | 15 | | | | | | | | |
| | 20 | | | | | | | | |

Remarks

Logged by: T. Murphy

Checked by: *[Signature]*

Project No.

106P06222

Hydro-Search, Inc.

Page 1 of 7

Project: Rocky Flats Plant

LOG OF BORING NO. 23-86

Date Drilled 9/11/86, 9/19/86, 9/22/86, 9/23/86 Coordinates N 37355.0 E 21154.4

Boring Method Hollow Stem Auger/NC core Ground Surface Elevation 5981.18

| Elev. (feet) | Depth (feet) | Sample Type | Graphic Log | Material Description | Penetration Resistance (Blows/Inch) | | Water Content (%) | | Other Tests |
|-----------------|-----------------|----------------|----------------|---|---|----|-------------------------|----|----------------|
| | | | | | 20 | 40 | 20 | 40 | |
| | 20 | | | 12.0-17.0'-Sample. Recovered 5.0/5.0'=100%. CLAYSTONE: light olive gray (5Y 5/2) to olive gray (5Y 3/2); silty; calcareous layer at 13.5'; firm; damp. | | | | | |
| | | | | 17.0-22.0'-Sample. Recovered 5.0/5.0'=100%. CLAYSTONE: light olive gray (5Y 5/2); silty; trace calcite at 18.1'; trace dark yellowish orange (10YR 6/6) iron staining; firm; damp. | | | | | |
| | 25 | | | 22.0-27.0'-Sample. Recovered 5.0/5.0'=100%. CLAYSTONE: light olive gray to olive gray (5Y 5/2 to 5Y 3/2); silty; some dark yellowish orange (10YR 6/6) iron staining; some black organic fragments; firm; damp. | | | | | |
| | | | | 27.0-32.0'-Sample. Recovered 5.0/5.0'=100%. CLAYSTONE: medium dark gray (N 4); silty; firm; damp. | | | | | |
| | 30 | | | 33.0-38.0'-Sample. Recovered 5.0/5.0'=100%. RQD 4.9/5.0'=98%. CLAYSTONE: dusky yellow (5Y 6/4) to light olive gray (5Y 5/2) to medium light gray (N 5); trace silt; some organic fragments; dark yellowish orange (10YR 6/6) mottling in light olive gray areas; no apparent fractures; moderately soft to firm; damp. | | | | | |
| | | | | 38.0-40.9'-Sample. Recovered 2.0/2.9'=69%. RQD 2.0/2.0'=100%. CLAYSTONE: medium light gray (N 5); iron staining at 39.0'; subvertical fracture with iron staining from 39.0' to 39.8'; core has a mottled appearance with yellowish gray (5Y 8/1) stains throughout; firm to moderately soft; damp. | | | | | |
| | 35 | | | | | | | | |
| | | | | | | | | | |
| | 40 | | | | | | | | |

Remarks Logged by: T. Murphy

Checked by: *[Signature]*

Project No.

106P06222

Hydro-Search, Inc.

Page 2 of 7

Project: Rocky Flats Plant

LOG OF BORING NO. 23-86

Date Drilled 9/11/86, 9/19/86, 9/22/86, 9/23/86 Coordinates N 37355.0 E 21154.4

Boring Method. Hollow Stem Auger/NC core Ground Surface Elevation 5981.18

| Elev. (feet) | Depth (feet) | Sample Type | Graphic Log | Material Description | Penetration Resistance (Blows/Inch) | | Water Content (%) | | Other Tests |
|-----------------|-----------------|----------------|----------------|---|---|----|-------------------------|----|----------------|
| | | | | | 20 | 40 | 20 | 40 | |
| | 40 | | | 40.9-45.9'-Sample. Recovered 2.8/5.0'=56%. RQD 1.6/2.8'=57%. CLAYSTONE: olive gray (5Y 4/1); trace silt; some organic fragments; vertical limonite filled fracture from 40.9' to 42.5'; horizontal limonite filled fracture at 41.9'; firm to moderately soft; damp. | | | | | |
| | 45 | | | 45.9-50.9'-Sample. Recovered 4.8/5.0'=96%. RQD 4.2/4.8'=86%. 45.9'-50.2'. CLAYSTONE: medium (N5) to medium dark gray (N4). Highly fractured interval with limonite along fracture planes (2 mm wide) from 48.3' to 49.6'; top 4.0' of core has abundant organics (wood fragments); firm; damp. | | | | | |
| | 50 | | | 50.2'-50.9'. CLAYSTONE: dusky yellow (5Y 6/4). | | | | | |
| | 55 | | | 50.9-55.9'-Sample. Recovered 4.0/5.0'=80%. RQD 2.6/4.0'=65%. 50.9'-51.5'. CLAYSTONE: light olive gray (5Y 5/2); heavy limonite along fracture planes. 51.5'-52.6'. CLAYSTONE: medium dark gray (N4) claystone with interbedded dusky yellow (5Y 6/4) clayey siltstone. 52.6'-55.9'. CLAYSTONE: medium dark gray (N4); silty; occasional subvertical fracture with limonite stain (up to 0.7' long); firm; damp. | | | | | |
| | 60 | | | 55.9-60.9'-Sample. Recovered 3.8/4.6'=83%. RQD 2.5/3.8'=66%. CLAYSTONE: olive gray (5Y 3/2) to medium dark gray (N4); silty; trace iron staining at top of core; firm; damp. | | | | | |

Remarks

Logged by: T. Murphy

Checked by: *[Signature]*Project No.
106P06222

Hydro-Search, Inc.

Page 3 of 7

Project: Rocky Flats Plant

LOG OF BORING NO. 23-86

Date Drilled 9/11/86, 9/19/86, 9/22/86, 9/23/86 Coordinates N 37355.0 E 21154.4

Boring Method - Hollow Stem Auger/NC core Ground Surface Elevation 5981.18

| Elev. (feet) | Depth (feet) | Sample Type | Graphic Log | Material Description | Penetration Resistance (Blows/inch) | | Water Content (%) | | Other Tests |
|-----------------|-----------------|----------------|----------------|---|---|----|-------------------------|----|----------------|
| | | | | | 20 | 40 | 20 | 40 | |
| | 60 | | | 60.9-65.5'-Sample. Recovered 4.6/4.6'=100%. RQD 4.3/4.6'=93%. SILTSTONE: dark gray (N 3) grading downward into dark greenish gray (5GY 4/1) clayey siltstone; some organic wood fragments; firm; damp. | | | | | |
| | 65 | | | 65.5-70.5'-Sample. Recovered 5.0/5.0'=100%. RQD 3.7/5.0'=74%. SILTSTONE: dark greenish gray (5GY 4/1); clayey; trace very fine-grained sand; dark gray (N 3) clayey siltstone from 68.5 to 70.5'; calcareous layer at 66.5 with slight dark yellowish orange (10YR 6/6) iron stains; firm; damp. | | | | | |
| | 70 | | | 70.5-75.5'-Sample. Recovered 2.5/5.0'=50%. RQD 0.0/2.5'=0%. CLAYSTONE: dark greenish gray (5GY 4/1); silty; trace very fine-grained sand; highly fractured; some organic fragments in vertical fractures; crumbly; damp. | | | | | |
| | 75 | | | 75.5-80.5'-Sample. Recovered 4.8/5.0'=96%. RQD 2.3/4.8'=48%. SILTSTONE: dark greenish gray (5GY 4/1); some clay and very fine-grained sand; few organics; very pale orange (10YR 8/2) calcareous clay layer at 77.5'; firm; damp. | | | | | |
| | 80 | | | | | | | | |

Remarks Logged by: T. Murphy

Checked by: *[Signature]*

Project No.

106P06222

Hydro-Search, Inc.

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Project: Rocky Flats Plant

LOG OF BORING NO. 23-86

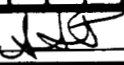
Date Drilled 9/11/86, 9/19/86, 9/22/86, 9/23/86 Coordinates N 37355.0 E 21154.4

Boring Method - Hollow Stem Auger/NC core Ground Surface Elevation 5931.18

| Elev. (feet) | Depth (feet) | Sample Type | Graphic Log | Material Description | Penetration Resistance (Blows/Inch) | | Water Content (%) | | Other Tests |
|-----------------|-----------------|----------------|----------------|---|---|----|-------------------------|----|----------------|
| | | | | | 20 | 40 | 20 | 40 | |
| | 80 | | | 80.5-85.5'-Sample. Recovered 4.6/5.0'=92%. RQD 2.7/4.6'=59%. SILTSTONE: dark gray (N 3) to dark greenish gray (5GY 4/1); interbedded 0.1' to 0.3' beds of sandy siltstone; convoluted bedding in places; occasional clayey siltstone; firm; damp. | | | | | |
| | 85 | | | 85.5-90.5'-Sample. Recovered 5.0/5.0'=100%. RQD 1.4/5.0'=28%. SILTSTONE: dark gray (N 3) to dark greenish gray (5GY 4/1); interbedded sandy siltstone beds (0.5' thick; occasional clayey siltstone layers; organics throughout; calcareous concretions from 87.8' to 88.4'; firm; damp. | | | | | |
| | 90 | | | 90.5-95.5'-Sample. Recovered 5.0/5.0'=100%. RQD 1.2/5.0'=24%. SILTSTONE: dark gray (N 3); interbedded sandy siltstone and clayey siltstone beds; sand is very fine-grained; vertical fracture from 92.5'-95.5' due to drilling; crumbly; firm; damp. | | | | | |
| | 95 | | | 95.5-100.5'-Sample. Recovered 4.8/5.0'=96%. RQD 3.8/5.0'=76%. SILTSTONE: dark gray (N 3); trace very fine-grained sand throughout; some organics; laminated; light olive gray (5Y 6/1) mottling around organic fragments; firm; damp. | | | | | |
| | 100 | | | | | | | | |

Remarks

Logged by: T. Murphy

Checked by: 

Project No.

106P06222

Hydro-Search, Inc.

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Project: Rocky Flats Plant

LOG OF BORING NO. 23-86

Date Drilled 9/11/86, 9/19/86, 9/22/86, 9/23/86 **Coordinates** N 37355.0 E 21154.4

Boring Method - Hollow Stem Auger/NC core **Ground Surface Elevation** 5981.18

| Elev. (feet) | Depth (feet) | Sample Type | Graphic Log | Material Description | Penetration Resistance (Blows/Inch) | | Water Content (%) | | Other Tests |
|-----------------|-----------------|----------------|----------------|--|---|----|-------------------------|----|----------------|
| | | | | | 20 | 40 | 20 | 40 | |
| | 100 | | | 100.5-105.5'-Sample. Recovered 5.0/5.0'=100%. RQD 2.1/5.0'=42%. SILTSTONE: dark gray (N 3); sandy; interbedded silty sandstone beds at 102.6' and 103.8' (approximately 0.4' thick). Sandstone layers consist of medium gray (N 5) very fine-grained, silty sand; moderately sorted; convoluted bedding characteristic of interbedded siltstone and sandstone layers; some calcareous concretions in sandy siltstone layers; abundant organics; firm to hard; damp. | | | | | |
| | 105 | | | 105.5-110.5'-Sample. Recovered 3.2/5.0'=64%. RQD 1.9/3.2'=59%. SANDSTONE: dark gray (N 3); very fine-grained; silty; clayey; lower 1.2' of core is clayey siltstone; soft to firm; damp. | | | | | |
| | 110 | | | 110.5-116.5'-Sample. Recovered 4.6/5.0'=92%. RQD 3.6/4.6'=78%. 110.5'-113.3'. SILTSTONE: dark gray (N 3); clayey; increasing sand content through interval. | | | | | |
| | | | | 113.3'-115.5'. SANDSTONE: medium gray (N 5); fine to very fine-grained; occasional clay-filled vertical fracture; moderately sorted; firm; damp. | | | | | |
| | 115 | | | 115.5-120.5'-Sample. Recovered 5.0/5.0'=100%. RQD 4.0/5.0'=80%. 115.5'-116.5'. SANDSTONE: medium gray (N 5); fine to very fine-grained; moderately sorted; firm; damp. Gradational change to siltstone at 116.5'. | | | | | |
| | | | | 116.5-120.5'. SILTSTONE: dark gray (N 3); very fine-grained; sandy; some clay; well sorted; organic fragments in subvertical fractures and horizontal layers; subvertical fractures have slickensides; fractures are 1.0' to 1.5' apart. | | | | | |
| | 120 | | | | | | | | |

Remarks

Logged by: T. Murphy

Checked by: 

Project No.

106P06222

Hydro-Search, Inc.

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Project: Rocky Flats Plant

LOG OF BORING NO. 23-86

Date Drilled 9/11/86, 9/19/86, 9/22/86, 9/23/86 Coordinates N 37355.0 E 21154.4

Boring Method. Hollow Stem Auger/NC core Ground Surface Elevation 5981.18

| Elev. (feet) | Depth (feet) | Sample Type | Graphic Log | Material Description | Penetration Resistance (Blows/Inch) | | Water Content (%) | | Other Tests |
|-----------------|-----------------|----------------|----------------|--|---|----|-------------------------|----|----------------|
| | | | | | 20 | 40 | 20 | 40 | |
| | 120 | | | 120.5-125.5'-Sample. Recovered 5.0/5.0'=100%. RQD 3.9/5.0'=78%. SILTSTONE: dark gray (N 3) to medium gray (N 5); clayey; with interbedded sandy siltstone; sand is fine to very fine-grained; moderately sorted; some organic fragments; slickensides along fracture planes. | | | | | |
| | 125 | | | 125.5-130.5'-Sample. Recovered 4.8/5.0'=96%. RQD 4.2/4.8'=88%. SILTSTONE: dark gray (N 3) to medium gray (N 5); clayey; with occasional interbedded sandy siltstone; occasional light brown (5YR 6/4) calcareous concretions; moderately sorted; firm; damp. | | | | | |
| | 130 | | | | | | | | |
| | | | | TOTAL DEPTH: 130.5' | | | | | |
| | 135 | | | | | | | | |
| | 140 | | | | | | | | |

Remarks

Logged by: T. Murphy

Checked by: 

Project No.

106P06222

Hydro-Search, Inc.

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WELL CONSTRUCTION SUMMARY

LOCATION or COORDS: _____
 N 37355.0 E 21154.4

ELEVATION: GROUND LEVEL 5981.18'
 TOP OF CASING 5981.91'

DRILLING SUMMARY:

TOTAL DEPTH Well: 117.00' Hole: 130.50'
 BOREHOLE DIAMETER 0.00' - 32.00': 7 1/2"
 32.00' - 130.50': 5 5/8"
 DRILLER Boyles Brothers Drilling Co.
 15865 W. 5th Avenue, Golden, CO
 (Dave Jarvie)
 RIG Mobile B-57
 BIT(S) 0.00' - 32.00': T5
 32.00' - 130.50': Carbide bit
 DRILLING FLUID 0.00' - 32.00': None
 32.00' - 130.50': air/water mist
 SURFACE CASING 5" x 32.50' steel w/ locking cap

WELL DESIGN:

BASIS: GEOLOGIC LOG X GEOPHYSICAL LOG _____
 CASING STRING(S): C=CASING S=SCREEN
 0.00' 32.00' C1 _____
 0.00' 113.25' C2 _____
 113.00' 117.25' S1 _____

CASING: C1 5" I.D. steel surface casing
 C2 2" I.D. Sch. 5 type 316 stainless steel, threaded and flush jointed.

SCREEN: S1 2" I.D. Sch 5 type 316 stainless steel, threaded and flush jointed, 0.010" wire wrap screen, 0.25' welded bottom cap.

CENTRALIZERS None (see comments)

FILTER MATERIAL 32-42 silica sand
 112.00' - 117.50'

CEMENT Portland Type I
 0.00' - 111.00'

OTHER 3/8" bentonite pellets
 111.00' - 112.00'
 117.50' - 130.50'

CONSTRUCTION TIME LOG:

| TASK | START | | FINISH | |
|--------------------|-------|------|--------|------|
| | DATE | TIME | DATE | TIME |
| DRILLING: | 1986 | | 1986 | |
| 7 1/2" auger | 9/11 | 1500 | 9/11 | 1800 |
| NC core | 9/19 | 1000 | 9/23 | 1500 |
| Reaming | 9/26 | 1217 | 9/26 | 1541 |
| GEOPHYS. LOGGING: | — | — | — | — |
| CASING: | | | | |
| 5" steel | 9/12 | 1000 | 9/12 | 1115 |
| 2" stainless | 9/26 | 1637 | 9/26 | 1650 |
| FILTER PLACEMENT: | 9/26 | 1738 | 9/26 | 2021 |
| CEMENTING: | 9/27 | 0830 | 9/27 | 1037 |
| LEVELCPMENT: | 10/1 | 1200 | 10/1 | 1200 |
| OTHER: | | | | |
| Bentonite | 9/26 | 2021 | 9/26 | 2130 |
| | 9/26 | 1542 | 9/26 | 1545 |
| Packer testing | 9/23 | 1500 | 9/26 | 1217 |
| Cementing 5" steel | 9/12 | 1130 | 9/12 | 1225 |

WELL DEVELOPMENT

See Well Development Summary Sheet.

COMMENTS:

No water encountered during drilling.

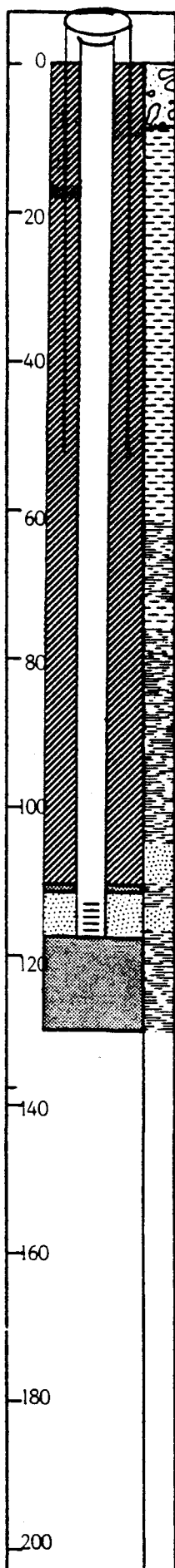
Top of stainless steel casing: 0.73'

Built well in NC rod; no centralizers used.

Protective casing and stainless steel casing were bent and had to be cut. New top of stainless steel casing: 0.08'.

LOCATION Golden, CO
 PERSONNEL T. Murphy

PROJECT 106P06222
 Rocky Flats Plant



PROGRAM SLUGT, VERSION 4.OCT. 1985

THIS PROGRAM CALCULATES MEAN TRANSMISSIVITIES FROM SLUG-TEST DATA BASED ON TWO ANALYTICAL APPROACHES:
 (1) METHOD OF COOPER, BREDEHOEFT AND PAPADOPULOS, 1967 (ARTICLE IN VOL.3,NO.1 OF WRR ENTITLED
 "RESPONSE OF A FINITE DIAMETER WELL TO AN INSTANTANEOUS CHARGE OF WATER")
 (2) METHOD OF BOWEN AND RICE, 1976 (ARTICLE IN VOL. 12, NO.3 OF WRR ENTITLED
 "A SLUG TEST FOR DETERMINING HYDRAULIC CONDUCTIVITY OF UNCONFINED AQUIFERS
 WITH COMPLETELY OR PARTIALLY PENETRATING WELLS")

PROJECT NO.: 6-011B-87

CLIENT: Rockwell International

ITE LOCATION: Rocky Flats Plant

DATE OF SLUG TEST: 2-2-88

FIELD INVESTIGATOR: K. McNeill

WELL NO.: 27-86

INPUT DATA ARE:

| | |
|--|--|
| INNER CASING DIAMETER = 2.00 INCHES | LENGTH OF SCREEN OR INTAKE PORTION = 5.50 FEET |
| INNER SCREEN OR OPEN-HOLE DIAMETER = 2.00 INCHES | DEPTH FROM STATIC LEVEL TO BOTTOM OF SCREEN = 11.70 FEET |
| DIAMETER OF DRILLED HOLE = 5.63 INCHES | THICKNESS OF SATURATED AQUIFER ZONE = 5.50 FEET |
| ESTIMATED POROSITY OF GRAVEL PACK = .25 | FALLING-HEAD INDEX = 0 ("1" IF FALLING, "0" IF RISING) |
| NUMBER OF HEAD-TIME DATA POINTS = 13 | |

| TIME (sec) | HEAD (FEET) |
|----------------|----------------|
| 41.00 | 1.220 |
| 51.00 | 1.220 |
| 59.00 | 1.220 |
| 69.00 | 1.220 |
| 127.00 | 1.220 |
| 137.00 | 1.220 |
| 217.00 | 1.220 |
| 337.00 | 1.220 |
| 462.00 | 1.220 |
| 702.00 | 1.220 |
| 742.00 | 1.220 |
| 1042.00 | 1.210 |
| 1342.00 | 1.210 |

HO WAS COMPUTED FROM INTERCEPT OF PLOT OF LOG(H) VS. TIME

SUCCESSIVE COMPUTED
 VALUES FOR H1
 (FEET)

1.2217
 1.2219

METHOD OF COOPER, BREDEHOEFT AND PAPADOPULOS

COMPUTED VALUE OF H_0 = 1.02 FEET

NOTE: TRANSMISSIVITY UNITS ARE IN FT**2/sec

AND PERMEABILITY UNITS ARE IN FT/sec

| ALPHA | STORATIVITY | MEAN TRANSMIS- SIVITY | MEAN PERMEA- BILITY | MINIMUM TRANS. | MAXIMUM TRANS. | RATIO OF "T" RANGE TO T2AR | ROOT MEAN SQUARE OF TIME DEVIATIONS | DIFFERENCE IN RMS |
|-----------|-------------|-----------------------------|---------------------------|-------------------|-------------------|----------------------------------|--|----------------------|
| 1.000E-01 | 1.000E-01 | 2.020E-09 | 3.672E-10 | 2.343E-10 | 3.383E-09 | 2.549700 | 319.55 | .00 |
| 1.000E-02 | 1.000E-02 | 5.902E-09 | 1.073E-09 | 6.741E-10 | 1.549E-08 | 2.510021 | 328.91 | -9.36 |
| 1.000E-03 | 1.000E-03 | 1.682E-08 | 3.058E-09 | 1.732E-09 | 3.978E-08 | 2.262192 | 461.62 | -132.71 |
| 1.000E-04 | 1.000E-04 | 3.567E-08 | 6.485E-09 | 3.662E-09 | 8.414E-08 | 2.256329 | 465.81 | -4.18 |
| 1.000E-05 | 1.000E-05 | 5.927E-08 | 1.078E-08 | 6.230E-09 | 1.431E-07 | 2.309766 | 428.95 | 36.86 |
| 1.000E-06 | 1.000E-06 | 8.866E-08 | 1.612E-08 | 9.618E-09 | 2.210E-07 | 2.384044 | 383.50 | 45.44 |
| 1.000E-07 | 1.000E-07 | 1.196E-07 | 2.174E-08 | 1.324E-08 | 3.042E-07 | 2.433341 | 358.19 | 25.31 |
| 1.000E-08 | 1.000E-08 | 1.486E-07 | 2.701E-08 | 1.660E-08 | 3.814E-07 | 2.455873 | 348.28 | 9.99 |
| 1.000E-09 | 1.000E-09 | 1.771E-07 | 3.221E-08 | 1.991E-08 | 4.574E-07 | 2.469429 | 342.72 | 5.48 |
| 1.000E-10 | 1.000E-10 | 2.058E-07 | 3.742E-08 | 2.325E-08 | 5.343E-07 | 2.482592 | 337.80 | 4.92 |

METHOD OF BOUWER AND RICE

COMPUTED RESULTS USING DIAMETER OF DRILLED HOLE:

PERMEABILITY = $7.10E-09$ FT/sec = $2.17E-07$ CM/sec

TRANSMISSIVITY = $3.92E-08$ FT**2/sec

COMPUTED RESULTS USING DIAMETER OF CASING AND SCREEN:

PERMEABILITY = $8.40E-09$ FT/sec = $2.36E-07$ CM/sec

TRANSMISSIVITY = $5.17E-08$ FT**2/sec

WELL NO.: 20-88

INPUT DATA ARE:

INNER CASING DIAMETER = 2.00 INCHES

INNER SCREEN OR OPEN-HOLE DIAMETER = 2.00 INCHES

DIAMETER OF DRILLED HOLE = 8.63 INCHES

LENGTH OF SCREEN OR INTAKE PORTION = 8.50 FEET

DEPTH FROM STATIC LEVEL TO BOTTOM OF SCREEN = 11.70 FEET

THICKNESS OF SATURATED AQUIFER CONE = 8.50 FEET

| TIME (sec) | HEAD (FEET) |
|---------------|----------------|
| 41.00 | 1.220 |
| 51.00 | 1.220 |
| 60.00 | 1.220 |
| 90.00 | 1.220 |
| 127.00 | 1.220 |
| 157.00 | 1.220 |
| 217.00 | 1.220 |
| 337.00 | 1.220 |
| 462.00 | 1.220 |
| 702.00 | 1.220 |
| 942.00 | 1.220 |
| 1042.00 | 1.210 |
| 1342.00 | 1.210 |

H₀ WAS COMPUTED FROM KNOWN VOLUME OF SLUG

VOLUME OF SLUG ENTERED = .03250 CUBIC FEET

METHOD OF COOPER, BREDEHOEFT AND PAPADOPULOS

COMPUTED RESULTS:

COMPUTED VALUE OF H₀ = 1.49 FEET

NOTE: TRANSMISSIVITY UNITS ARE IN FT²/sec

AND PERMEABILITY UNITS ARE IN FT/sec

| ALPHA | STORATIVITY | MEAN TRANSMIS- SIVITY | MEAN PERMEA- BILITY | MINIMUM TRANS. | MAXIMUM TRANS. | RATIO OF AT RANGE TO FEAR | ROOT MEAN SQUARE OF TIME DEVIATIONS | DIFFERENCE IN RMS |
|-----------|-------------|-----------------------------|---------------------------|-------------------|-------------------|---------------------------------|--|----------------------|
| 1.000E-01 | 1.000E-01 | 2.775E-06 | 5.046E-07 | 2.890E-07 | 8.793E-06 | 3.064610 | 513.68 | .00 |
| 1.000E-02 | 1.000E-02 | 8.409E-06 | 1.529E-06 | 8.611E-07 | 2.665E-05 | 3.066787 | 514.26 | -.58 |
| 1.000E-03 | 1.000E-03 | 1.532E-05 | 2.786E-06 | 1.559E-06 | 4.857E-05 | 3.067829 | 514.54 | -.28 |
| 1.000E-04 | 1.000E-04 | 2.227E-05 | 4.049E-06 | 2.259E-06 | 7.059E-05 | 3.068289 | 514.66 | -.13 |
| 1.000E-05 | 1.000E-05 | 2.905E-05 | 5.282E-06 | 2.942E-06 | 9.208E-05 | 3.068528 | 514.72 | -.06 |
| 1.000E-06 | 1.000E-06 | 3.570E-05 | 6.492E-06 | 3.613E-06 | 1.132E-04 | 3.068674 | 514.76 | -.04 |
| 1.000E-07 | 1.000E-07 | 4.227E-05 | 7.685E-06 | 4.275E-06 | 1.340E-04 | 3.068767 | 514.79 | -.02 |
| 1.000E-08 | 1.000E-08 | 4.878E-05 | 8.868E-06 | 4.931E-06 | 1.546E-04 | 3.068872 | 514.81 | -.02 |
| 1.000E-09 | 1.000E-09 | 5.524E-05 | 1.004E-05 | 5.582E-06 | 1.751E-04 | 3.068890 | 514.82 | -.02 |
| 1.000E-10 | 1.000E-10 | 6.166E-05 | 1.121E-05 | 6.230E-06 | 1.954E-04 | 3.068927 | 514.83 | -.01 |

PACKER TEST ANALYSIS

WELL NO. 23-86

ROCKY FLATS PLANT JOB NO. 106P06222

DATE TESTED: 09/29/86 BY: T. MURPHY

TEST INTERVAL (FEET BELOW G.S.): 37.25 - 48.43

MATERIAL TESTED: ARAPAHOE CLAYSTONE

DEPTH TO WATER (FEET BELOW G.S.): 107.50

$$K = \frac{Q}{2(\pi)(L)(H)} \ln\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00055508 (FEET³/MIN)

L = LENGTH OF TEST INTERVAL = 11.18 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)

= 42.84 + 5.00 + 18.16 * 2.31 = 89.79

R = BOREHOLE RADIUS = .14 FEET

K = HYDRAULIC CONDUCTIVITY = .00000039 FT/MIN

K = .00000020 CM/SEC

P2/3 TEST

TEST ABORTED, PACKER FAILED

2ND P1/3 TEST

TEST ABORTED

PACKER TEST ANALYSIS
 WELL NO. 23-86
 ROCKY FLATS PLANT JOB NO. 106P06222
 DATE TESTED: 09/29/86 BY: T. MURPHY
 TEST INTERVAL (FEET BELOW G.S.): 44.68 - 52.35
 MATERIAL TESTED: ARAPAHOE CLAYSTONE
 DEPTH TO WATER (FEET BELOW G.S.): 107.50

$$K = \frac{Q}{2(\pi)(L)(H)} \ln\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00104246 (FEET³/MIN)
 L = LENGTH OF TEST INTERVAL = 7.67 FEET
 TEST INTERVAL IS ABOVE WATER TABLE
 HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
 + GAGE PRESSURE (IN FEET)
 = 48.51 + 5.00 + 21.27 * 2.31 = 102.65
 R = BOREHOLE RADIUS = .14 FEET

 K = HYDRAULIC CONDUCTIVITY = .00000085 FT/MIN
 K = .00000043 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00406155 (FEET³/MIN)
 L = LENGTH OF TEST INTERVAL = 7.67 FEET
 TEST INTERVAL IS ABOVE WATER TABLE
 HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
 + GAGE PRESSURE (IN FEET)
 = 48.51 + 5.00 + 29.71 * 2.31 = 122.15
 R = BOREHOLE RADIUS = .14 FEET

 K = HYDRAULIC CONDUCTIVITY = .00000279 FT/MIN
 K = .00000141 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00009477 (FEET³/MIN)
 L = LENGTH OF TEST INTERVAL = 7.67 FEET
 TEST INTERVAL IS ABOVE WATER TABLE
 HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
 + GAGE PRESSURE (IN FEET)
 = 48.51 + 5.00 + 21.27 * 2.31 = 102.65
 R = BOREHOLE RADIUS = .14 FEET

 K = HYDRAULIC CONDUCTIVITY = .00000008 FT/MIN
 K = .00000004 CM/SEC

PACKER TEST ANALYSIS
 WELL NO. 23-86
 ROCKY FLATS PLANT JOB NO. 106P06222
 DATE TESTED: 09/29/86 BY: T. MURPHY
 TEST INTERVAL (FEET BELOW G.S.): 52.35 - 63.55
 MATERIAL TESTED: ARAPAHOE CLAYSTONE
 DEPTH TO WATER (FEET BELOW G.S.): 107.50

$$K = \frac{Q}{2(\pi)(L)(H)} \frac{L}{\ln\left(\frac{L}{R}\right)}$$

1ST P1/3 TEST

Q = INJECTION RATE = .00013539 (FEET³/MIN)
 L = LENGTH OF TEST INTERVAL = 11.20 FEET
 TEST INTERVAL IS ABOVE WATER TABLE
 HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
 + GAGE PRESSURE (IN FEET)
 = 57.95 + 5.00 + 14.66 * 2.31 = 96.81
 R = BOREHOLE RADIUS = .14 FEET

 K = HYDRAULIC CONDUCTIVITY = .00000009 FT/MIN
 K = .00000004 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00255878 (FEET³/MIN)
 L = LENGTH OF TEST INTERVAL = 11.20 FEET
 TEST INTERVAL IS ABOVE WATER TABLE
 HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
 + GAGE PRESSURE (IN FEET)
 = 57.95 + 5.00 + 10.66 * 2.31 = 87.57
 R = BOREHOLE RADIUS = .14 FEET

 K = HYDRAULIC CONDUCTIVITY = .00000183 FT/MIN
 K = .00000093 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00023015 (FEET³/MIN)
 L = LENGTH OF TEST INTERVAL = 11.20 FEET
 TEST INTERVAL IS ABOVE WATER TABLE
 HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
 + GAGE PRESSURE (IN FEET)
 = 57.95 + 5.00 + 24.66 * 2.31 = 119.91
 R = BOREHOLE RADIUS = .14 FEET

 K = HYDRAULIC CONDUCTIVITY = .00000012 FT/MIN
 K = .00000006 CM/SEC

PACKER TEST ANALYSIS
 WELL NO. 23-86
 ROCKY FLATS PLANT JOB NO. 106P06222
 DATE TESTED: 09/29/86 BY: T. MURPHY
 TEST INTERVAL (FEET BELOW G.S.): 66.10 - 77.30
 MATERIAL TESTED: ARAPAHOE CLAYSTONE
 DEPTH TO WATER (FEET BELOW G.S.): 107.50

$$K = \frac{Q}{2(\pi)(L)(H)} \frac{L}{\ln\left(\frac{R}{r}\right)}$$

1ST P1/3 TEST

Q = INJECTION RATE = .00033846 (FEET3/MIN)
 L = LENGTH OF TEST INTERVAL = 11.20 FEET
 TEST INTERVAL IS ABOVE WATER TABLE
 HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
 + GAGE PRESSURE (IN FEET)
 = 71.70 + 5.00 + 30.57 * 2.31 = 147.32
 R = BOREHOLE RADIUS = .14 FEET

 K = HYDRAULIC CONDUCTIVITY = .00000014 FT/MIN
 K = .00000007 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00197662 (FEET3/MIN)
 L = LENGTH OF TEST INTERVAL = 11.20 FEET
 TEST INTERVAL IS ABOVE WATER TABLE
 HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
 + GAGE PRESSURE (IN FEET)
 = 71.70 + 5.00 + 43.57 * 2.31 = 177.35
 R = BOREHOLE RADIUS = .14 FEET

 K = HYDRAULIC CONDUCTIVITY = .00000070 FT/MIN
 K = .00000036 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00004062 (FEET3/MIN)
 L = LENGTH OF TEST INTERVAL = 11.20 FEET
 TEST INTERVAL IS ABOVE WATER TABLE
 HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
 + GAGE PRESSURE (IN FEET)
 = 71.70 + 5.00 + 30.57 * 2.31 = 147.32
 R = BOREHOLE RADIUS = .14 FEET

 K = HYDRAULIC CONDUCTIVITY = .00000002 FT/MIN
 K = .00000001 CM/SEC

PACKER TEST ANALYSIS
WELL NO. 23-86
ROCKY FLATS PLANT JOB NO. 106P06222
DATE TESTED: 09/29/86 BY: T. MURPHY
TEST INTERVAL (FEET BELOW G.S.): 67.80 - 79.00
MATERIAL TESTED: ARAPAHOE FORMATION
DEPTH TO WATER (FEET BELOW G.S.): 107.50

$$K = \frac{Q}{2(\pi)(L)(H)} \frac{L}{R} \ln\left(\frac{R}{L}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00296493 (FEET³/MIN)
L = LENGTH OF TEST INTERVAL = 11.20 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 73.40 + 5.00 + 31.30 * 2.31 = 150.70
R = BOREHOLE RADIUS = .14 FEET

K = HYDRAULIC CONDUCTIVITY = .00000123 FT/MIN
K = .00000063 CM/SEC

P2/3 TEST

TEST ABORTED

Q = INJECTION RATE = .00000000 (FEET³/MIN)
L = LENGTH OF TEST INTERVAL = 11.20 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 73.40 + 5.00 + 43.90 * 2.31 = 179.81
R = BOREHOLE RADIUS = .14 FEET

K = HYDRAULIC CONDUCTIVITY = .00000000 FT/MIN
K = .00000000 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00000000 (FEET³/MIN)
L = LENGTH OF TEST INTERVAL = 11.20 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 73.40 + 5.00 + .00 * 2.31 = 78.40
R = BOREHOLE RADIUS = .14 FEET

K = HYDRAULIC CONDUCTIVITY = .00000000 FT/MIN
K = .00000000 CM/SEC

PACKER TEST ANALYSIS
WELL NO. 23-86
ROCKY FLATS PLANT JOB NO. 106P06222
DATE TESTED: 09/29/86 BY: T. MURPHY
TEST INTERVAL (FEET BELOW G.S.): 71.80 - 83.00
MATERIAL TESTED: ARAPAHOE CLAYSTONE
DEPTH TO WATER (FEET BELOW G.S.): 107.50

$$K = \frac{Q}{2(\pi)(L)(H)} \ln\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00121847 (FEET³/MIN)
L = LENGTH OF TEST INTERVAL = 11.20 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
 + GAGE PRESSURE (IN FEET)
 = 77.40 + 5.00 + 33.02 * 2.31 = 158.68
R = BOREHOLE RADIUS = .14 FEET

K = HYDRAULIC CONDUCTIVITY = .00000048 FT/MIN
K = .00000024 CM/SEC

P2/3 TEST

TEST ABORTED

2ND P1/3 TEST

TEST ABORTED

PACKER TEST ANALYSIS

WELL NO. 23-86

ROCKY FLATS PLANT JOB NO. 106P06222

DATE TESTED: 09/29/86 BY: T. MURPHY

TEST INTERVAL (FEET BELOW G.S.): 78.00 - 79.00

MATERIAL TESTED: ARAPAHOE CLAYSTONE

DEPTH TO WATER (FEET BELOW G.S.): 107.50

$$K = \frac{Q}{2(\pi)(L)(H)} \ln\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00296493 (FEET³/MIN)

L = LENGTH OF TEST INTERVAL = 1.00 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 78.50 + 5.00 + 31.30 * 2.31 = 155.80

R = BOREHOLE RADIUS = .14 FEET

K = HYDRAULIC CONDUCTIVITY = .00000606 FT/MIN

K = .00000308 CM/SEC

P2/3 TEST

TEST ABORTED

2ND P1/3 TEST

TEST ABORTED

PACKER TEST ANALYSIS

WELL NO. 23-86

ROCKY FLATS PLANT JOB NO. 106P06222

DATE TESTED: 09/29/86 BY: T. MURPHY

TEST INTERVAL (FEET BELOW G.S.): 82.72 - 93.92

MATERIAL TESTED: ARAPAHOE CLAYSTONE

DEPTH TO WATER (FEET BELOW G.S.): 107.50

$$K = \frac{Q}{2(\pi)(L)(H)} \ln\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00162462 (FEET³/MIN)

L = LENGTH OF TEST INTERVAL = 11.20 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 88.32 + 5.00 + 37.72 * 2.31 = 180.45

R = BOREHOLE RADIUS = .14 FEET

K = HYDRAULIC CONDUCTIVITY = .00000056 FT/MIN

K = .00000029 CM/SEC

P2/3 TEST

TEST ABORTED

2ND P1/3 TEST

TEST ABORTED

PACKER TEST ANALYSIS

WELL NO. 23-86

ROCKY FLATS PLANT JOB NO. 106P06222

DATE TESTED: 09/29/86 BY: T. MURPHY

TEST INTERVAL (FEET BELOW G.S.): 84.05 - 95.25

MATERIAL TESTED: ARAPAHOE FORMATION

DEPTH TO WATER (FEET BELOW G.S.): 107.50

$$K = \frac{Q}{2(P_i)(L)(H)} \ln\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00208493 (FEET³/MIN)

L = LENGTH OF TEST INTERVAL = 11.20 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 89.65 + 5.00 + 39.58 * 2.31 = 186.08

R = BOREHOLE RADIUS = .14 FEET

K = HYDRAULIC CONDUCTIVITY = .00000070 FT/MIN

K = .00000036 CM/SEC

P2/3 TEST

TEST ABORTED

2ND P1/3 TEST

TEST ABORTED

PACKER TEST ANALYSIS

WELL NO. 23-86

ROCKY FLATS PLANT JOB NO. 106P06222

DATE TESTED: 09/23/86 BY: T. MURPHY

TEST INTERVAL (FEET BELOW G.S.): 104.21 - 115.40

MATERIAL TESTED: ARAPAHOE CLAYSTONE

DEPTH TO WATER (FEET BELOW G.S.): 107.50

$$K = \frac{Q}{2(\pi)(L)(H)} \frac{L}{\ln\left(\frac{L}{R}\right)}$$

1ST P1/3 TEST

Q = INJECTION RATE = .00043323 (FEET³/MIN)

L = LENGTH OF TEST INTERVAL = 11.19 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 109.81 + 5.00 + 48.75 * 2.31 = 227.42

R = BOREHOLE RADIUS = .14 FEET

K = HYDRAULIC CONDUCTIVITY = .00000012 FT/MIN

K = .00000006 CM/SEC

P2/3 TEST

TEST ABORTED, IMPROPER PACKER SEAL

2ND P1/3 TEST

Q = INJECTION RATE = .00102893 (FEET³/MIN)

L = LENGTH OF TEST INTERVAL = 11.19 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 109.81 + 5.00 + 48.75 * 2.31 = 227.42

R = BOREHOLE RADIUS = .14 FEET

K = HYDRAULIC CONDUCTIVITY = .00000028 FT/MIN

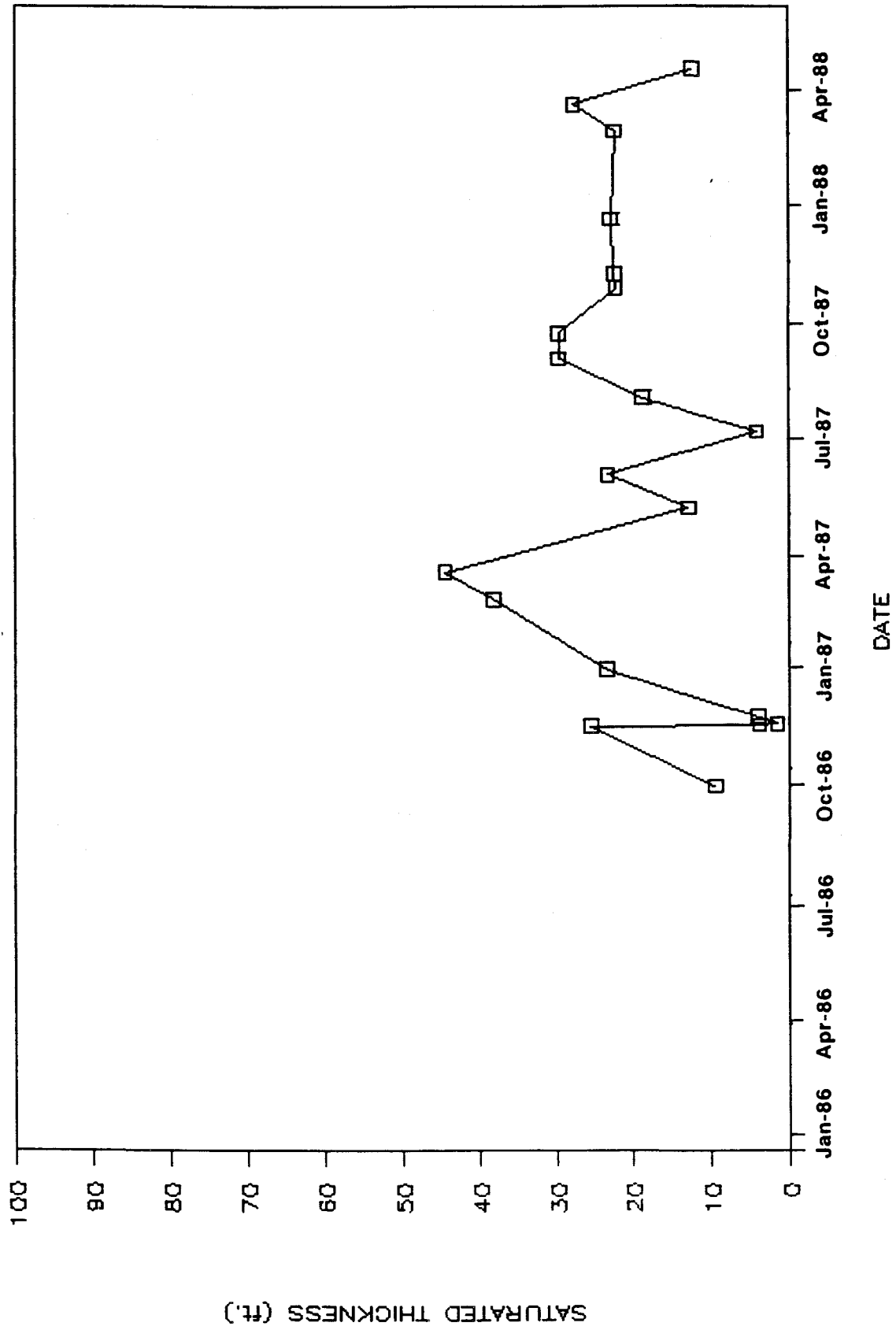
K = .00000014 CM/SEC

ROCKY FLATS SOLAR PONDS

WATER LEVEL SUMMARY

| WELL NUMBER | DATE | GROUND SURFACE ELEVATION | TOP OF CASING ELEVATION | STICK UP | DEPTH OF SI BASE | WATER DEPTH BELOW TOC | WATER SURFACE ELEVATION |
|----------------|----------|--------------------------------|-------------------------------|-------------|------------------------|-----------------------------|-------------------------------|
| 2386 | 10/01/86 | 5981.18 | 5981.91 | 0.73 | 117.25 | 107.8 | 5874.16 |
| | 11/17/86 | | | | | 91.79 | 5890.12 |
| | 11/18/86 | | | | | 113.2 | 5868.66 |
| | 11/19/86 | | | | | 115.6 | 5866.30 |
| | 11/25/86 | | | | | 113.2 | 5868.69 |
| | 01/01/87 | | | | | 93.92 | 5887.99 |
| | 02/25/87 | | | | | 79.25 | 5902.66 |
| | 03/18/87 | | | | | 73.00 | 5908.91 |
| | 05/08/87 | | | | | 104.4 | 5877.53 |
| | 06/03/87 | | | | | 94.02 | 5887.89 |
| | 07/08/87 | | | | | 113.0 | 5868.86 |
| | 08/04/87 | | | | | 98.60 | 5883.31 |
| | 09/03/87 | | | | | 87.80 | 5894.11 |
| | 09/23/87 | | | | | 87.80 | 5894.11 |
| | 10/28/87 | | | | | 95.10 | 5886.81 |
| | 11/09/87 | | | | | 94.90 | 5887.01 |
| | 12/21/87 | | | | | 94.50 | 5887.41 |
| | 02/29/88 | | | | | 95.00 | 5886.91 |
| | 03/21/88 | | | | | 89.70 | 5892.21 |
| | 04/18/88 | | | | | 104.9 | 5877.01 |

SATURATED THICKNESS IN WELL # 23-86 (SP)



INDEX OF DATA

Boring No.: 24-86

Completed as well? Yes

Data in File

- ☒ Log of Borehole
- ☒ Well Construction Summaries
- ☐ Well Development Summaries
- ☐ Hydraulic Conductivity Test Data and Results
- ☐ Packer Test Data and Results
- ☒ Water Level Data
- ☒ Saturated Thickness Hydrographs

Project: Rocky Flats Plant

LOG OF BORING NO. 24-86

Date Drilled 9/12/86

Coordinates N 37354.8 E 21172.8


Boring Method. Hollow Stem Auger

Ground Surface Elevation 5980.45

| Elev. (feet) | Depth (feet) | Sample Type | Graphic Log | Material Description | Penetration Resistance (Blows/Inch) | | Water Content (%) | | Other Tests |
|-----------------|-----------------|----------------|----------------|---|---|----|-------------------------|----|----------------|
| | | | | | 20 | 40 | 20 | 40 | |
| | 0 | | | ARTIFICIAL FILL 0-2.5'-Sample. Recovered 2.0/2.5'=80%. GRAVEL: yellowish gray (5Y 7/2) to light olive gray (5Y 5/2) granitic pebbles and coarse sand; some silt; trace clay; base of sample is grayish brown (5YR 3/2); poorly sorted; soft; dry. 2.5-5.0'-Sample. Recovered 0.9/2.5'=36%. GRAVEL: yellowish gray (5Y 7/2) to light olive gray (5Y 5/2) granite and quartzite pebbles; pale greenish yellow (10Y 8/2) sandy matrix; poorly sorted; angular; crumbly; dry. 5.0-7.0'-Sample. Recovered 0.0/2.0'=0%. Large boulder prevented sample recovery. 7.0-12.0'-Sample. Recovered 5.0/5.0'=100%. 7.0-7.2'. GRAVEL: Same as above; dry. | | | | | |
| | 5 | | | | | | | | |
| | 10 | | | | | | | | |
| | 15 | | | ARAPAHOE FORMATION 7.2-12.0'. CLAYSTONE: pale olive (10Y 6/2) to greenish gray (5GY 6/1); silty; some fine-grained sand and silty sand stringers at 7.8'; sand is slightly calcareous; claystone contains dark yellowish orange (10YR 6/6) iron staining; calcareous pockets along fractures throughout sample; firm; damp. TOTAL DEPTH: 12.0' | | | | | |
| | 20 | | | | | | | | |

Remarks

Logged by: T. Murphy

Checked by: Project No.
106P06222

Hydro-Search, Inc.

Page 1 of 1

WELL CONSTRUCTION SUMMARY

 LOCATION or COORDS: _____
 N 37354.8 E 21172.8

 ELEVATION: GROUND LEVEL 5980.45'
 TOP OF CASING 5982.07'

DRILLING SUMMARY:

TOTAL DEPTH Well: 7.45' Hole: 12.00'

BOREHOLE DIAMETER 7 1/4"

DRILLER Boyles Brothers Drilling Co.

15865 W. 5th Avenue

Golden, CO (Dave Jarvie)

RIG Mobile B-57

BIT(S) T5

DRILLING FLUID None

SURFACE CASING 5" x 4" steel w/ locking cap

WELL DESIGN:

BASIS: GEOLOGIC LOG ☒ GEOPHYSICAL LOG _____

CASING STRING(S): C=CASING S=SCREEN

| | | | | |
|-------|-------|----|---|---|
| 0.00' | 2.95' | CI | — | — |
| 2.95' | 7.45' | SI | — | — |
| — | — | — | — | — |
| — | — | — | — | — |
| — | — | — | — | — |
| — | — | — | — | — |
| — | — | — | — | — |
| — | — | — | — | — |
| — | — | — | — | — |
| — | — | — | — | — |

CASING: CI 2" I.D. Sch. 5 type 316 stainless steel, threaded and flush jointed.

 SCREEN: SI 2" I.D. Sch. 5 type 316 stainless steel, threaded and flush jointed. 0.010" wire wrap screen
 0.25' welded bottom cap.

 CENTRALIZERS Type 304 stainless steel
 4.34' - 5.59'

 FILTER MATERIAL 32-42 silica sand
 2.50' - 7.70'

CEMENT Portland Type I

0.00' - 2.00'

OTHER 3/8" bentonite pellets

2.00' - 2.50'

7.70' - 11.90'

CONSTRUCTION TIME LOG:

| TASK | START | | FINISH | |
|-------------------|-------|------|--------|------|
| | DATE | TIME | DATE | TIME |
| | 1986 | | 1986 | |
| DRILLING: | | | | |
| 7 1/4" auger | 9/12 | 1320 | 9/12 | 1400 |
| | | | | |
| GEOPHYS. LOGGING: | — | — | — | — |
| CASING: | | | | |
| 2" stainless | 9/12 | 1525 | 9/12 | 1526 |
| | | | | |
| FILTER PLACEMENT: | 9/12 | 1526 | 9/12 | 1530 |
| CEMENTING: | 9/12 | 1532 | 9/12 | 1535 |
| LEVELCPMENT: | 9/16 | 1650 | 9/16 | 1650 |
| OTHER: | | | | |
| Bentonite | 9/12 | 1530 | 9/12 | 1532 |
| | 9/12 | 1520 | 9/12 | 1525 |
| | | | | |
| | | | | |
| | | | | |

WELL DEVELOPMENT

See Well Development Summary Sheet.

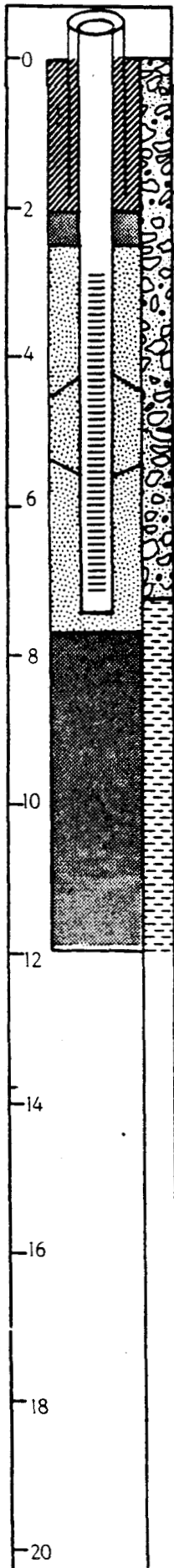
COMMENTS:

No water encountered during drilling.

Top of stainless steel casing: 1.62'

Cave from TD to 11.90'

 LOCATION Golden, CO
 PERSONNEL T. Murphy

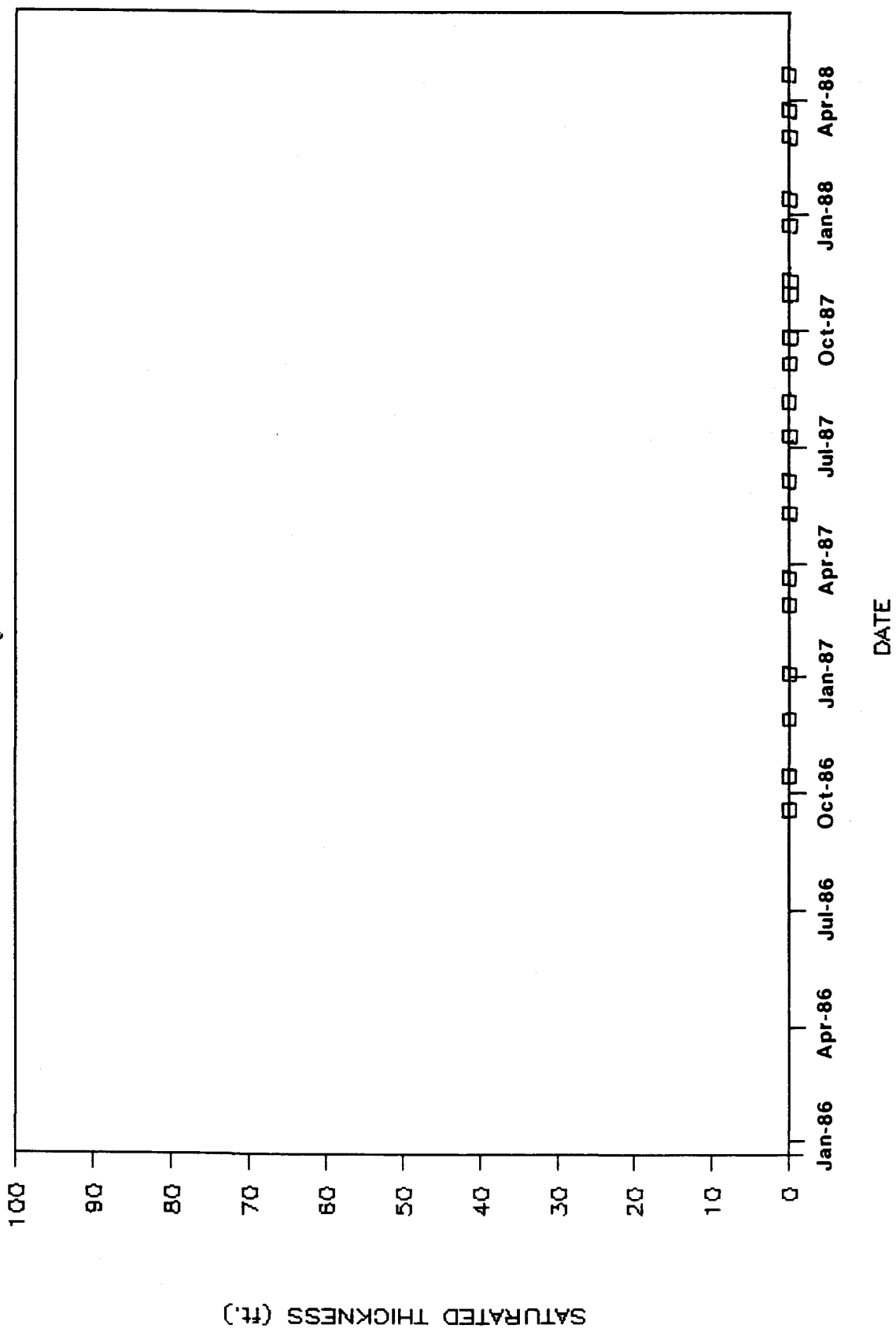
 PROJECT 106P06222
 Rocky Flats Plant


ROCKY FLATS SOLAR PONDS

WATER LEVEL SUMMARY

| <u>WELL</u> <u>NUMBER</u> | <u>DATE</u> | <u>GROUND</u> <u>SURFACE</u> <u>ELEVATION</u> | <u>TOP OF</u> <u>CASING</u> <u>ELEVATION</u> | <u>STICK</u> <u>UP</u> | <u>DEPTH</u> <u>OF SI</u> <u>BASE</u> | <u>WATER</u> <u>DEPTH</u> <u>BELOW TOC</u> | <u>WATER</u> <u>SURFACE</u> <u>ELEVATION</u> |
|------------------------------|-------------|---|--|---------------------------|---|--|--|
| 2486 | 09/16/86 | 5980.45 | 5982.07 | 1.62 | 7.25 | -1.00 | DRY |
| | 10/13/86 | | | | | -1.00 | DRY |
| | 11/26/86 | | | | | -1.00 | DRY |
| | 01/01/87 | | | | | -1.00 | DRY |
| | 02/25/87 | | | | | -1.00 | DRY |
| | 03/18/87 | | | | | -1.00 | DRY |
| | 05/08/87 | | | | | -1.00 | DRY |
| | 06/03/87 | | | | | -1.00 | DRY |
| | 07/08/87 | | | | | 8.65 | 5973.42 |
| | 08/04/87 | | | | | -1.00 | DRY |
| | 09/03/87 | | | | | -1.00 | DRY |
| | 09/24/87 | | | | | -1.00 | DRY |
| | 10/28/87 | | | | | -1.00 | DRY |
| | 11/09/87 | | | | | -1.00 | DRY |
| | 12/21/87 | | | | | -1.00 | DRY |
| | 01/11/88 | | | | | -1.00 | DRY |
| | 02/29/88 | | | | | -1.00 | DRY |
| | 03/21/88 | | | | | -1.00 | DRY |
| | 04/18/88 | | | | | 8.70 | 5973.37 |

SATURATED THICKNESS IN WELL # 24-86 (SP)



INDEX OF DATA

Boring No.: 25-86

Completed as well? Yes

Data in File

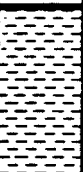
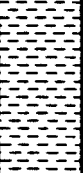
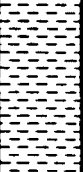
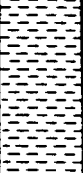
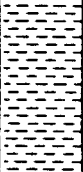
- X Log of Borehole
- X Well Construction Summaries
- Well Development Summaries
- X Hydraulic Conductivity Test Data
and Results
- X Packer Test Data and Results
- X Water Level Data
- X Saturated Thickness Hydrographs

| | | | | | | |
|---------------------------------------|--|--|---|--|-------|--|
| Project: Rocky Flats Plant | | | LOG OF BORING NO. | | 25-86 | |
| Date Drilled 9/13/86 - 9/17/86 | | | Coordinates N 37426.3 E 21726.5 | | | |
| Boring Method NC Core | | | Ground Surface Elevation 5974.45 | | | |

| Elev. (feet) | Depth (feet) | Sample Type | Graphic Log | Material Description | Penetration Resistance (Blows/Inch) 20 40 | Water Content (%) 20 40 | Other Tests |
|-----------------|-----------------|----------------|----------------|--|---|-------------------------------------|----------------|
| | 0 | | | ARTIFICIAL FILL | | | |
| | | | | 0-2.0'-Cuttings. GRAVEL: granite and quartzite pebbles and large cobbles; dry. | | | |
| | | | | 2.0-9.0'-Cuttings. GRAVEL: pale yellowish brown (10YR 6/2); clayey; some silt and sand; 50% fines; dry to slightly damp. | | | |
| | 5 | | | 9.0-11.0'-Cuttings. CLAY: gray orange (10YR 7/4); sandy and silty; caliche stringers; 1-2% quartzite pebbles; damp. | | | |
| | | | | 11.0-13.0'-Cuttings. CLAY: gray orange (10YR 7/2); gravelly; silty; 20% quartzite pebbles; caliche stringers; damp. | | | |
| | 10 | | | 13.0-17.0'-Cuttings. CLAY: Same as above; light olive brown (5Y 5/6); damp. | | | |
| | | | | | | | |
| | 15 | | | ARAPAHOE FORMATION | | | |
| | | | | 17.0-19.5'-Cuttings. CLAYSTONE: moderate yellowish brown (10YR 5/4); sub-plastic; damp. | | | |
| | 20 | | | 19.5-20.0'-Cuttings. CLAYSTONE: grayish brown (5YR 3/2); plastic; moist. | | | |

| | | |
|----------------|------------------------------------|--------------------------------|
| Remarks | Logged by: T. Gulliver & T. Murphy | Checked by: <i>[Signature]</i> |
|----------------|------------------------------------|--------------------------------|

| | | |
|---------------------------------|---------------------------|-------------|
| Project No. 106P06222 | Hydro-Search, Inc. | Page 1 of 5 |
|---------------------------------|---------------------------|-------------|

| Project: | | Rocky Flats Plant | | LOG OF BORING NO. | | 25-86 | |
|-----------------|-----------------|-------------------|---|---|---|----------------------------|-------------|
| Date Drilled | | 9/13/86 - 9/17/86 | | Coordinates | | N 37426.3 E 21726.5 | |
| Boring Method | | NC Core | | Ground Surface Elevation | | 5974.45 | |
| Elev. (feet) | Depth (feet) | Sample Type | Graphic Log | Material Description | Penetration Resistance (Blows/inch) 20 40 | Water Content (%) 20 40 | Other Tests |
| | 20 | |  | 20.0-22.0'-Cuttings. CLAYSTONE: light grayish brown (5YR 6/1); firm; damp. | | | |
| | 25 | |  | 22.0-37.0'-Cuttings. CLAYSTONE: light grayish brown (5YR 6/1); silty; very wet (cored with water). | | | |
| | 30 | |  | | | | |
| | 35 | |  | | | | |
| | 40 | |  | 37.0-41.6'-Sample. Recovered 0.0/4.6'=0%. | | | |

Remarks Logged by: T. Gulliver & T. Murphy Checked by: *[Signature]*

Project No. 106P06222

Hydro-Search, Inc.

Page 2 of 5

| | | | | | | | | | |
|---------------------------------------|--|--|--|--|--|--|--|---|--|
| Project: Rocky Flats Plant | | | | LOG OF BORING NO. | | | | 25-86 | |
| Date Drilled 9/13/86 - 9/17/86 | | | | Coordinates N 37426.3 E 21726.5 | | | | Ground Surface Elevation 5974.45 | |
| Boring Method NC Core | | | | | | | | | |

| Elev. (feet) | Depth (feet) | Sample Type | Graphic Log | Material Description | Penetration Resistance (Blows/Inch) 20 40 | Water Content (%) 20 40 | Other Tests |
|-----------------|-----------------|-------------|-------------|--|---|---------------------------------|-------------|
| | 40 | | | | | | |
| | | | | 41.6-46.6'-Sample. Recovered 5.0/5.0'=100%. RQD 3.0/5.0'=60%. CLAYSTONE: light olive gray (5Y 5/2) to olive gray (5Y 3/2); light brown to dark yellowish orange (10YR 6/6) iron staining; trace silt; ironstone; altered claystone concretions from 46.0-46.6'; firm; damp. | | | |
| | 45 | | | 46.6-51.6'-Sample. Recovered 5.0/5.0'=100%. RQD 3.6/5.0'=72%. CLAYSTONE: light brown (10YR 6/6) grading to medium dark gray (N 4); ironstone from 46.6-47.0'; heavy iron staining at 48.0'; high angle fractures with calcite along fracture planes; firm; moist. | | | |
| | 50 | | | 51.6-56.6'-Sample. Recovered 5.0/5.0'=100%. RQD 4.3/5.0'=86%. CLAYSTONE: grayish black (N 2) to dark gray (N 3); occasional dark yellowish orange (10YR 6/6) iron staining; some coaly layers and fragments; firm; damp. | | | |
| | 55 | | | | | | |
| | | | | 56.6-61.6'-Sample. Recoverd 5.5/5.0'=100%. RQD 3.5/5.0'=57%. CLAYSTONE: grayish black (N 2); silty; organic wood fragments; fractures due to drilling; firm; damp. | | | |
| | 60 | | | | | | |

| | | | | | | | | | |
|---------------------------------|--|--|------------------------------------|--|--|--------------------------------|-------------|--|--|
| Remarks | | | Logged by: T. Gulliver & T. Murphy | | | Checked by: <i>[Signature]</i> | | | |
| Project No. 106P06222 | | | Hydro-Search, Inc. | | | | Page 3 of 5 | | |

| | | | | | | | |
|---------------------------------------|--|--|--|---|--|-------|--|
| Project: Rocky Flats Plant | | | | LOG OF BORING NO. | | 25-86 | |
| Date Drilled 9/13/86 - 9/17/86 | | | | Coordinates N 37426.3 E 21726.5 | | | |
| Boring Method NC Core | | | | Ground Surface Elevation 5974.45 | | | |

| Elev. (feet) | Depth (feet) | Sample Type | Graphic Log | Material Description | Penetration Resistance (Blows/Inch) | | Water Content (%) | | Other Tests |
|-----------------|-----------------|----------------|----------------|---|---|----|-------------------------|----|----------------|
| | | | | | 20 | 40 | 20 | 40 | |
| 60 | | | | <p>61.6-66.6'-Sample. Recovered 4.0/5.0'=80%. RQD 3.4/4.0'=92%. CLAYSTONE: light olive gray (5Y 5/2); silty; occasional very fine-grained sandstone laminations at 63.5'; calcareous at 63.0'; hard; dry to damp.</p> | | | | | |
| 65 | | | | <p>66.6-71.6'-Sample. Recovered 5.0/5.0'=100%. RQD 5.0/5.0'=100%. CLAYSTONE: grayish black (N3); thin interbedded silty claystone and clayey siltstone; highly fractured with numerous subvertical slickensides; crumbly to firm; damp.</p> | | | | | |
| 70 | | | | <p>71.6-74.0'-Sample. Recovered 0.0/2.4'=0%.</p> | | | | | |
| 75 | | | | <p>74.0-79.0'-Sample. Recovered 5.0/5.0'=100%. RQD 4.2/5.0'=85%. SANDSTONE: dark greenish gray (5GY 4/1); very fine-grained; silty; some clay; laminations of siltstone; convoluted bedding; moderately sorted; firm; damp.</p> | | | | | |
| 80 | | | | <p>79.0-81.1'-Sample. Recovered 2.1/2.1'=100%. RQD 1.3/2.1'=62%. SANDSTONE: Same as above; damp.</p> | | | | | |

| | | |
|----------------|------------------------------------|--------------------------------|
| Remarks | Logged by: T. Gulliver & T. Murphy | Checked by: <i>[Signature]</i> |
|----------------|------------------------------------|--------------------------------|

| | | |
|---------------------------------|---------------------------|-------------|
| Project No. 106P06222 | Hydro-Search, Inc. | Page 4 of 5 |
|---------------------------------|---------------------------|-------------|

Project: Rocky Flats Plant

LOG OF BORING NO.

25-86

Date Drilled 9/13/86 - 9/17/86

Coordinates N 37426.3 E 21726.5

Boring Method NC Core

Ground Surface Elevation 5974.45

| Elev. (feet) | Depth (feet) | Sample Type | Graphic Log | Material Description | Penetration Resistance (Blows/Inch) | | Water Content (%) | | Other Tests |
|-----------------|-----------------|----------------|----------------|--|---|----|-------------------------|----|----------------|
| | | | | | 20 | 40 | 20 | 40 | |
| | 80 | | | 81.1-82.6'-Sample. Recovered 1.3/1.5'=87%. RQD 0.6/1.3'=46%. SANDSTONE: Same as above; some black coal lenses; firm; damp. | | | | | |
| | 85 | | | 82.6-85.6'-Sample. Recovered 3.0/3.2'=94%. RQD 1.3/3.0'=43%. SILTSTONE: grayish black (N3); alternating laminations of very fine-grained sandy siltstone and clayey siltstone; very fine coaly lenses; thinly bedded; some convoluted bedding; firm; dry to damp. | | | | | |
| | 90 | | | 85.5-89.8'-Sample. Recovered 2.4/4.2'=57%. RQD 0.0/2.4'=0%. SILTSTONE: Same as above; dry to damp. | | | | | |
| | | | | TOTAL DEPTH: 89.8' | | | | | |
| | 95 | | | | | | | | |
| | 100 | | | | | | | | |

Remarks

Logged by: T. Gulliver & T. Murphy

Checked by: 

Project No.

106P06222

Hydro-Search, Inc.

Page 5 of 5

WELL CONSTRUCTION SUMMARY

LOCATION or COORDS: N 37426.3 E 21726.5

ELEVATION: GROUND LEVEL 5974.45'
TOP OF CASING 5976.55'

DRILLING SUMMARY:

TOTAL DEPTH Well: 82.00' Hole: 89.80'
BOREHOLE DIAMETER 0.00' - 38.50': 7 1/4"
38.50' - 89.80': 3 3/4"
DRILLER Boyles Brothers Drilling Co.
15865 W. 5th Avenue
Golden, CO (Dave Jarvie)
RIG Mobile B-57
BIT(S) 0.00' - 38.56': Blade bit; 38.56' -
89.80': Carbide bit
DRILLING FLUID 0.00' - 38.50': None; 38.50'
- 89.80': air/water mist
SURFACE CASING 5" x 41' steel w/ locking
can

WELL DESIGN:

| BASIS: GEOLOGIC LOG <u>X</u> | | | GEOPHYSICAL LOG | | |
|-------------------------------------|--------|----|-----------------|---|--|
| CASING STRING(S): C=CASING S=SCREEN | | | | | |
| 0.00' | 38.50' | C1 | | - | |
| 0.00' | 59.90' | C2 | | - | |
| 59.90' | 82.00' | S1 | | - | |
| | | | | - | |
| | | | | - | |
| | | | | - | |
| | | | | - | |
| | | | | - | |
| | | | | - | |

CASING: C1 5" I.D. steel surface casing
C2 2" I.D. Sch. 5 type 316 stainless steel, threaded and flush jointed.

SCREEN: S1 2" I.D. Sch. 5 type 316 stainless steel, threaded and flush jointed, 0.010" wire wrap screen
0.25' welded bottom cap.

CENTRALIZERS None (see comments)

FILTER MATERIAL 32-42 silica sand
66.10' - 83.60'

CEMENT Portland Type I
0.00' - 64.00'

OTHER 3/8" bentonite pellets
64.00' - 66.10'
83.60' - 84.60'

CONSTRUCTION TIME LOG:

| TASK | START | | FINISH | |
|---------------------|-------|------|--------|------|
| | DATE | TIME | DATE | TIME |
| DRILLING: | 1986 | | 1986 | |
| <u>7½" auger</u> | 8/26 | 1401 | 8/27 | 1330 |
| <u>NC core</u> | 9/13 | 1400 | 9/16 | 1700 |
| <u>Reaming</u> | 9/17 | 1030 | 9/17 | 1315 |
| GEOPHYS. LOGGING: | — | — | — | — |
| CASING: | | | | |
| <u>5" steel</u> | 8/27 | 1353 | 8/27 | 1421 |
| <u>2" stainless</u> | 9/17 | 1537 | 9/17 | 1545 |
| | | | | |
| FILTER PLACEMENT: | 9/17 | 1526 | 9/17 | 1804 |
| CEMENTING: | 9/18 | 0904 | 9/18 | 1010 |
| DEVELOPMENT: | 9/30 | 1430 | 10/1 | 0945 |
| OTHER: | | | | |
| <u>Bentonite</u> | 9/17 | 1805 | 9/17 | 1816 |
| | 9/17 | 1505 | 9/17 | 1506 |
| <u>Cementing 5"</u> | 8/27 | 1540 | 8/27 | 1606 |
| <u>steel</u> | | | | |
| | | | | |
| | | | | |

WELL DEVELOPMENT

See Well Development Summary Sheet

COMMENTS:

No water encountered during drilling.

Top of stainless steel casing: 2.10'

Cave from TD to 84.60'



SHEET _____ of _____

CLIENT/SUBJECT _____ W.O. NO. _____

TASK DESCRIPTION _____ TASK NO. _____

PREPARED BY _____ DEPT _____ DATE _____

MATH CHECK BY _____ DEPT _____ DATE _____

METHOD REV. BY _____ DEPT _____ DATE _____

| | |
|-------------|------------|
| APPROVED BY | |
| | |
| DEPT _____ | DATE _____ |

WELL 25-86

Hydraulic Conductivity (cm/sec) = 7×10^{-8}

Flowrate (gpm) = 0.0593 gpm

Screened Interval (ft below G.L.) = 59.9-82.00'

59.9-71.6 claystone

71.6-74.0 missing core

74.0-82.0 sandstone

Method of Analysis: Residual-drawdown Plot

(Driscoll, 1986 - pg 256.)

CLIENT/SUBJECT _____ W.O. NO. _____

TASK DESCRIPTION _____ TASK NO. _____

PREPARED BY _____ DEPT _____ DATE _____

MATH CHECK BY _____ DEPT _____ DATE _____

METHOD REV. BY _____ DEPT _____ DATE _____

| | |
|-------------|------------|
| APPROVED BY | |
| | |
| DEPT _____ | DATE _____ |

WELL 25-86

$$T \text{ (gpd/ft)} = \frac{264 Q}{\Delta S'} = \frac{(264)(0.0593)}{451} = 3.47 \times 10^{-2}$$

where $Q \text{ (gpm)} = 1.75 \text{ gal} / 29.5 \text{ min} = 0.0593 \text{ gpm}$

$\Delta S' = \frac{1}{2} t$ change in residual drawdown / log cycle
 $= 451 \text{ ft} / \log \text{ cycle (see attached plot)}$

$$K \text{ (gpd/ft}^2\text{)} = T / b = 3.47 \times 10^{-2} / 22.1 = 1.57 \times 10^{-3}$$

where $b \text{ (ft)} = 22.1 \text{ ft}$

$$K \text{ (cm/sec)} = 1.57 \times 10^{-3} \text{ gpd/ft}^2 \times \frac{4.72 \times 10^{-5} \text{ cm/sec}}{\text{gpd/ft}^2} = 7 \times 10^{-8}$$

This method is valid where $u \leq 0.01$

solving for t for $u \leq 0.01$.

$$t \text{ (min)} = \frac{r^2 S}{4 T u} = \frac{(0.156)^2 10^{-3}}{4 (3.47 \times 10^{-2}) (0.01)} \times \frac{1440 \text{ min}}{\text{day}} \times \frac{7.482 \text{ gal}}{\text{ft}^3}$$

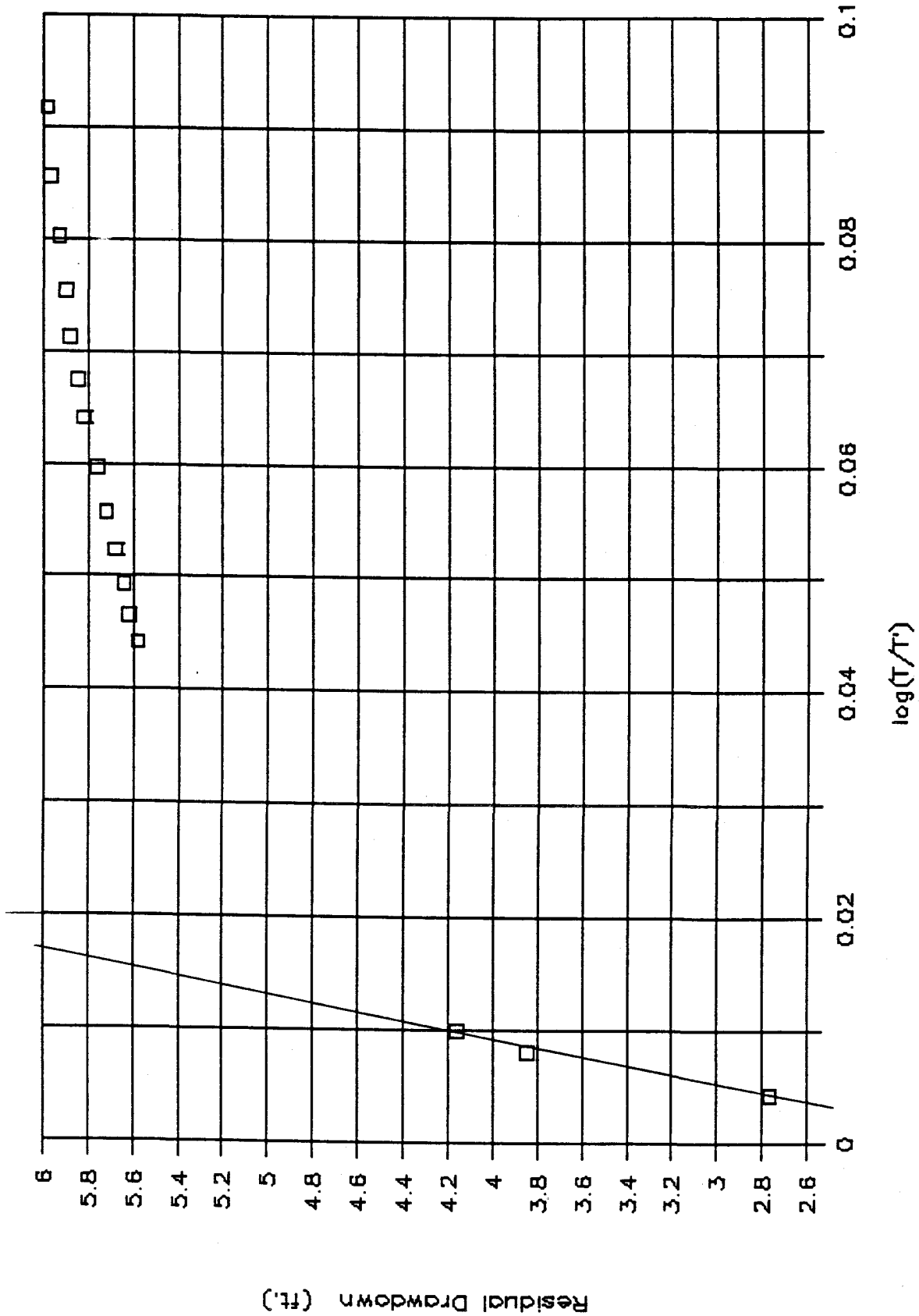
$= 189 \text{ min.}$

where $r \text{ (ft)} = \left(\frac{3.75}{24} \right) \text{ ft} = (0.156) \text{ ft}$

$S = 10^{-3}$ assumed S for confined aquifer

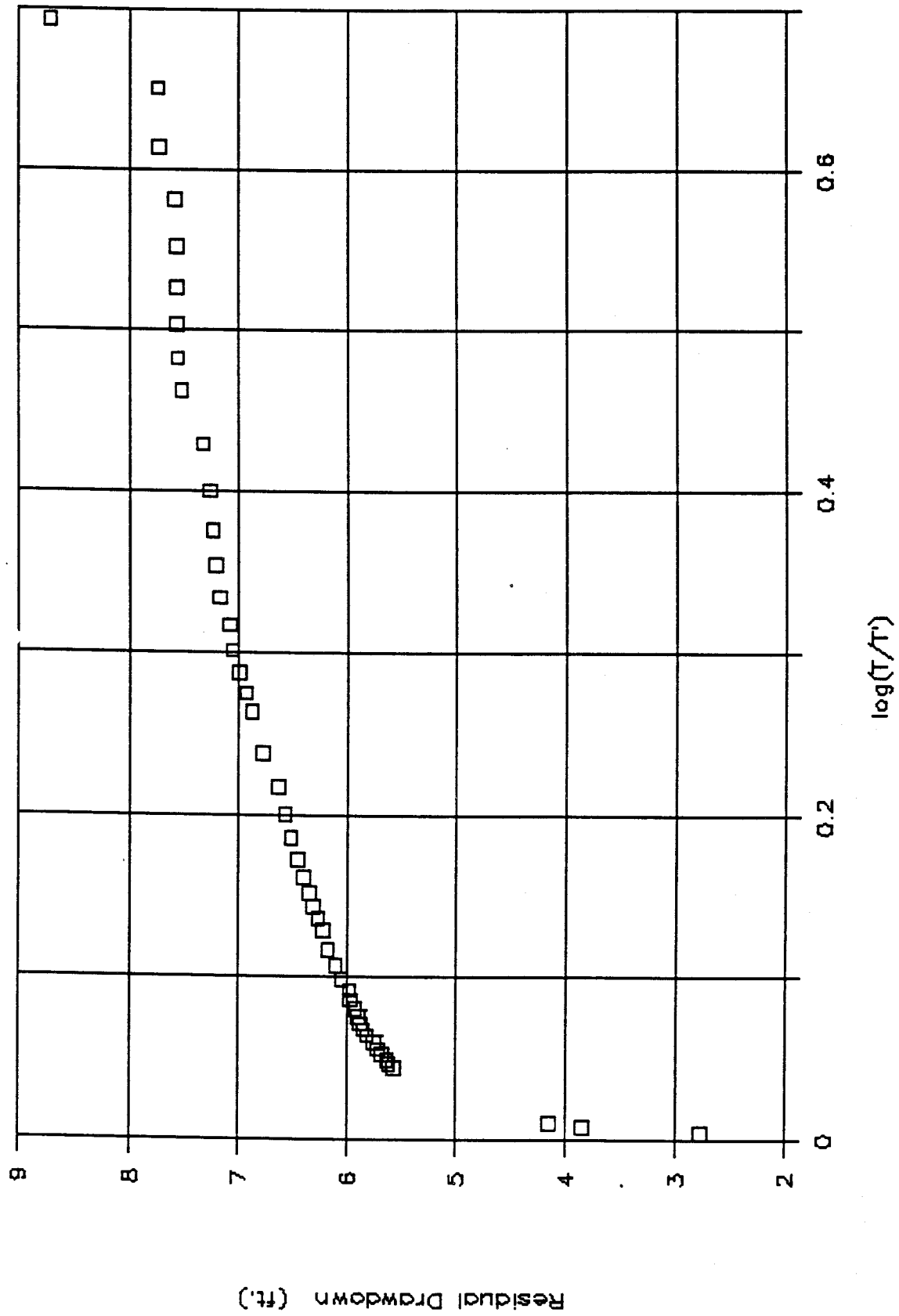
ΔS is based on points where $t \geq 1303 \text{ min.}$

WELL 25-86

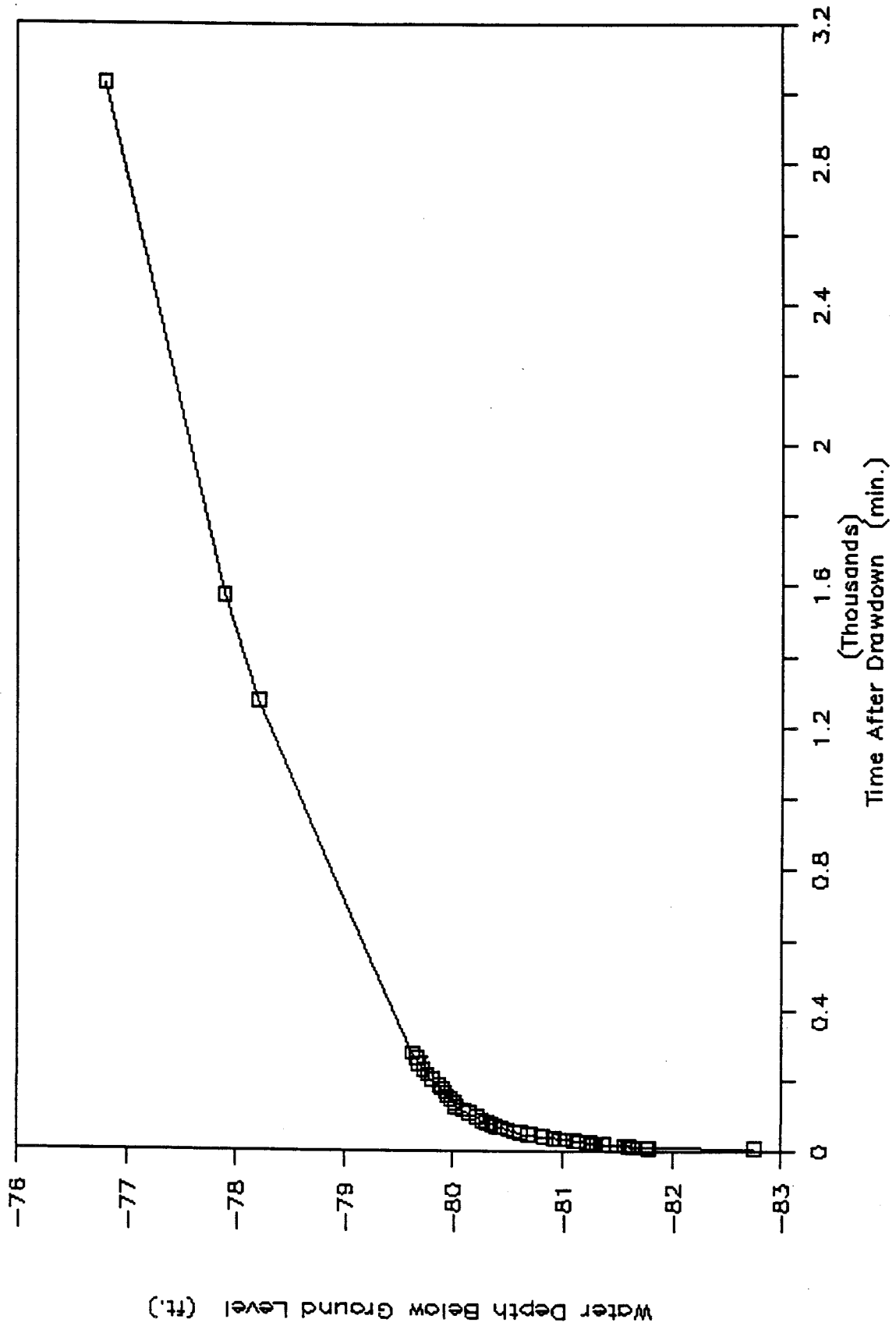


$$\Delta s' = \frac{(6 - 0) \text{ ft}}{0.0170 - 0.0037} = 451 \text{ ft/log cycle}$$

WELL 25-86



WELL 25-86



WELL 25-86

| T Time (min.) | T' T Prime (min.) | Water Level Rsd (ft.) | s' Drwn (ft.) | log(T/T') |
|---------------------|-------------------------|-----------------------------|---------------------|-----------|
| 37.00 | 7.50 | 82.75 | 8.71 | 0.69 |
| 38.00 | 8.50 | 81.78 | 7.74 | 0.65 |
| 39.00 | 9.50 | 81.77 | 7.73 | 0.61 |
| 40.00 | 10.50 | 81.63 | 7.59 | 0.58 |
| 41.00 | 11.50 | 81.61 | 7.57 | 0.55 |
| 42.00 | 12.50 | 81.61 | 7.57 | 0.53 |
| 43.00 | 13.50 | 81.61 | 7.57 | 0.50 |
| 44.00 | 14.50 | 81.60 | 7.56 | 0.48 |
| 45.00 | 15.50 | 81.57 | 7.53 | 0.46 |
| 47.00 | 17.50 | 81.37 | 7.33 | 0.43 |
| 49.00 | 19.50 | 81.30 | 7.26 | 0.40 |
| 51.00 | 21.50 | 81.28 | 7.24 | 0.38 |
| 53.00 | 23.50 | 81.25 | 7.21 | 0.35 |
| 55.00 | 25.50 | 81.22 | 7.18 | 0.33 |
| 57.00 | 27.50 | 81.13 | 7.09 | 0.32 |
| 59.00 | 29.50 | 81.10 | 7.06 | 0.30 |
| 61.00 | 31.50 | 81.03 | 6.99 | 0.29 |
| 63.00 | 33.50 | 80.97 | 6.93 | 0.27 |
| 65.00 | 35.50 | 80.92 | 6.88 | 0.26 |
| 70.00 | 40.50 | 80.82 | 6.78 | 0.24 |
| 75.00 | 45.50 | 80.68 | 6.64 | 0.22 |
| 80.00 | 50.50 | 80.61 | 6.57 | 0.20 |
| 85.00 | 55.50 | 80.56 | 6.52 | 0.19 |
| 90.00 | 60.50 | 80.49 | 6.45 | 0.17 |
| 95.00 | 65.50 | 80.44 | 6.40 | 0.16 |
| 100.00 | 70.50 | 80.39 | 6.35 | 0.15 |
| 105.00 | 75.50 | 80.35 | 6.31 | 0.14 |
| 110.00 | 80.50 | 80.31 | 6.27 | 0.14 |
| 115.00 | 85.50 | 80.26 | 6.22 | 0.13 |
| 125.00 | 95.50 | 80.22 | 6.18 | 0.12 |
| 135.00 | 105.50 | 80.14 | 6.10 | 0.11 |
| 145.00 | 115.50 | 80.09 | 6.05 | 0.10 |
| 155.00 | 125.50 | 80.02 | 5.98 | 0.09 |
| 165.00 | 135.50 | 80.01 | 5.97 | 0.09 |
| 175.00 | 145.50 | 79.97 | 5.93 | 0.08 |
| 185.00 | 155.50 | 79.94 | 5.90 | 0.08 |
| 195.00 | 165.50 | 79.92 | 5.88 | 0.07 |
| 205.00 | 175.50 | 79.89 | 5.85 | 0.07 |
| 215.00 | 185.50 | 79.86 | 5.82 | 0.06 |
| 230.00 | 200.50 | 79.80 | 5.76 | 0.06 |
| 245.00 | 215.50 | 79.76 | 5.72 | 0.06 |
| 260.00 | 230.50 | 79.72 | 5.68 | 0.05 |
| 275.00 | 245.50 | 79.68 | 5.64 | 0.05 |
| 290.00 | 260.50 | 79.66 | 5.62 | 0.05 |
| 305.00 | 275.50 | 79.62 | 5.58 | 0.04 |
| 1303.00 | 1273.50 | 78.20 | 4.16 | 0.01 |
| 1602.00 | 1572.50 | 77.89 | 3.85 | 0.01 |
| 3061.00 | 3031.50 | 76.81 | 2.77 | 0.00 |

AQUIFER TEST DATA

WELL 25-86
PUMPING or OBSERVATION WE
PUMPING RECOVERY DATA
PAGE 1 OF 2

TYPE OF AQUIFER TEST Base Down Rec. Test
HOW Q MEASURED 4 in. Puckey
HOW W.L.'s MEASURED GAUGE
RAD./DIST. OF/FROM PUMPING WELL 1'
MEAS. POINT FOR W.L.'s _____
ELEVATION OF MEAS. POINT _____

DEPTH OF PUMP/AIRPIPE _____
PUMP ON: date 11-12-86 time 10:35
PUMP OFF: date 11-12-86 time 11:04:30
DURATION OF AQUIFER TEST _____

| | | TIME | | WATER LEVEL DATA | | | | DISCHARGE | | RECORDED BY | COMMENT |
|-----|------------|-----------|-----------|--------------------|------------------------|-------------|---------|-----------|---|-------------|-----------------------------|
| | | t = _____ | at t' = 0 | STATIC WATER LEVEL | CONVERSION CORRECTIONS | WATER LEVEL | s or s' | READING | Q | | |
| DAY | CLOCK TIME | t | t' | READING | | | | | | | |
| | 11:05 | | | 80+2.50 | | | | | | | 20.84.40 |
| | 11:05.5 | | | 80+2.50 | | | | | | | 11:05.30 - FINISH |
| | 11:06 | 1.0 | | 80+2.50 | | | | | | | 1754 - ANT. 6 |
| | 11:06.5 | 1.5 | | 80+2.50 | | | | | | | |
| | 11:07 | 2.0 | | 80+2.50 | | | | | | | |
| | 11:07.5 | 2.5 | | 80+2.50 | | | | | | | 1.44 = 45+ |
| | 11:08 | 3.0 | | 80+2.50 | | | | | | | gall = 1.35 |
| | 11:08.5 | 3.5 | | 80+2.50 | | | | | | | |
| | 11:09 | 4.0 | | 80+2.50 | | | | | | | |
| | 11:09.5 | 4.5 | | 80+2.50 | | | | | | | (READING) 11:09.30 REC-76.7 |
| | 11:10 | 5.0 | | 80+2.50 | | | | | | | |
| | 11:10.5 | | | | | | | | | | |
| | 11:11 | 6.0 | | 80+2.50 | | | | | | | |
| | 11:12 | 7 | | 80+2.25 | 1.50 | 81.75 | 8.71 | | | CW | |
| | 11:13 | 8 | | 80+2.28 | 1.50 | 81.78 | 7.74 | | | CW | |
| | 11:14 | 9 | | 80+2.29 | | 81.77 | 7.73 | | | CW | |
| | 11:15 | 10 | | 80+2.13 | | 81.63 | 7.59 | | | | |
| | 11:16 | 11 | | 80+2.11 | | 81.61 | 7.57 | | | | |
| | 11:17 | 12 | | 80+2.11 | | 81.61 | 7.57 | | | | |
| | 11:18 | 13 | | 80+2.11 | | 81.61 | 7.57 | | | | |
| | 11:19 | 14 | | 80+2.10 | | 81.60 | 7.56 | | | | |
| | 11:20 | 15 | | 80+2.07 | | 81.57 | 7.53 | | | | |
| | 11:21 | 17 | | 80+2.87 | | 81.37 | 7.33 | | | CW | |
| | 11:24 | 19 | | 80+2.80 | | 81.30 | 7.26 | | | AB | |
| | 11:26 | 21 | | 80+2.78 | | 81.28 | 7.24 | | | | |
| | 11:28 | 23 | | 80+2.75 | | 81.25 | 7.21 | | | | |
| | 11:30 | 25 | | 80+2.72 | | 81.22 | 7.19 | | | | |
| | 11:32 | 27 | | 80+2.63 | | 81.13 | 7.09 | | | | |
| | 11:34 | 29 | | 80+2.60 | | 81.10 | 7.06 | | | | |
| | 11:36 | 31 | | 80+2.53 | | 81.03 | 6.99 | | | | |
| | 11:38 | 33 | | 80+2.47 | | 80.97 | 6.93 | | | | |
| | 11:40 | 35 | | 80+2.42 | | 80.92 | 6.88 | | | | |
| | 11:45 | 40 | | 80+2.32 | | 80.82 | 6.78 | | | | |
| | 11:50 | 45 | | 80+2.18 | | 80.68 | 6.64 | | | | |
| | 11:55 | 50 | | 80+2.11 | | 80.61 | 6.57 | | | | |
| | 12:00 | 55 | | 80+2.06 | | 80.56 | 6.52 | | | | |
| | 12:05 | 60 | | 80+1.99 | | 80.49 | 6.45 | | | | |
| | 12:10 | 65 | | 80+1.94 | | 80.44 | 6.40 | | | | |
| | 12:15 | 70 | | 80+1.87 | | 80.37 | 6.35 | | | | |
| | 12:20 | 75 | | 80+1.85 | | 80.35 | 6.31 | | | | |
| | 12:25 | 80 | | 80+1.81 | | 80.31 | 6.27 | | | | |

LOCATION
PERSONNEL

PROJECT

WELL 25-86
PUMPING or OBSERVATION WELL
PUMPING or ~~RECOVERY DATA~~
PAGE 2 OF 2

TYPE OF AQUIFER TEST BAIL DOWN RECD. TEST
HOW Q MEASURED A GAS METER
HOW W.L.'s MEASURED EXAMPLE
RAD./DIST. OF/FROM PUMPING WELL 1"
MEAS. POINT FOR W.L.'s _____
ELEVATION OF MEAS. POINT _____

DEPTH OF PUMP/AIRPIPE _____
PUMP ON: date 11-12-86 time _____
PUMP OFF: date 11-13-86 time _____
DURATION OF AQUIFER TEST _____

[illegible]

PACKER TEST ANALYSIS
 WELL NO. 25-86
 ROCKY FLATS PLANT JOB NO. 106PO6222
 DATE TESTED: 9/06/86 BY: T. GULLIVER
 TEST INTERVAL (FEET BELOW G.S.): 35.88 - 47.06
 MATERIAL TESTED: ARAPAHOE CLAYSTONE
 DEPTH TO WATER (FEET BELOW G.S.): 69.92

$$K = \frac{Q}{2(\pi)(L)(H)} \ln\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00128193 (FEET³/MIN)
 L = LENGTH OF TEST INTERVAL = 11.18 FEET
 TEST INTERVAL IS ABOVE WATER TABLE
 HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
 + GAGE PRESSURE (IN FEET)
 = 41.47 + 9.00 + .00 * 2.31 = 50.47
 R = BOREHOLE RADIUS = .16 FEET

 K = HYDRAULIC CONDUCTIVITY = .00000153 FT/MIN
 K = .00000078 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00407424 (FEET³/MIN)
 L = LENGTH OF TEST INTERVAL = 11.18 FEET
 TEST INTERVAL IS ABOVE WATER TABLE
 HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
 + GAGE PRESSURE (IN FEET)
 = 41.47 + 5.33 + 5.00 * 2.31 = 58.35
 R = BOREHOLE RADIUS = .16 FEET

 K = HYDRAULIC CONDUCTIVITY = .00000421 FT/MIN
 K = .00000214 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00050092 (FEET³/MIN)
 L = LENGTH OF TEST INTERVAL = 11.18 FEET
 TEST INTERVAL IS ABOVE WATER TABLE
 HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
 + GAGE PRESSURE (IN FEET)
 = 41.47 + 6.87 + .00 * 2.31 = 48.34
 R = BOREHOLE RADIUS = .16 FEET

 K = HYDRAULIC CONDUCTIVITY = .00000063 FT/MIN
 K = .00000032 CM/SEC

PACKER TEST ANALYSIS
WELL NO. 25-86
ROCKY FLATS PLANT JOB NO. 106PO6222
DATE TESTED: 9/06/86 BY: T. GULLIVER
TEST INTERVAL (FEET BELOW G.S.): 48.05 - 59.23
MATERIAL TESTED: ARAPAHOE CLAYSTONE
DEPTH TO WATER (FEET BELOW G.S.): 69.92

$$K = \frac{Q}{2(\pi)(L)(H)} \ln\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00001692 (FEET³/MIN)
L = LENGTH OF TEST INTERVAL = 11.18 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 53.64 + 10.70 + .00 * 2.31 = 64.34
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000002 FT/MIN
K = .00000001 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00005802 (FEET³/MIN)
L = LENGTH OF TEST INTERVAL = 11.18 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 53.64 + 5.33 + 10.30 * 2.31 = 82.76
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000004 FT/MIN
K = .00000002 CM/SEC

2ND P1/3 TEST

TEST ABORTED

PACKER TEST ANALYSIS

WELL NO. 25-86

ROCKY FLATS PLANT JOB NO. 106PO6222

DATE TESTED: 9/06/86 BY: T. GULLIVER

TEST INTERVAL (FEET BELOW G.S.): 58.86 - 70.04

MATERIAL TESTED: ARAPAHOE CLAYSTONE

DEPTH TO WATER (FEET BELOW G.S.): 69.92

$$K = \frac{Q}{2(PI)(L)(H)} \frac{L}{LN(\frac{L}{R})}$$

1ST P1/3 TEST

Q = INJECTION RATE = .00005802 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 11.18 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)

= 64.45 + 10.84 + .00 * 2.31 = 75.29

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000005 FT/MIN

K = .00000002 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00187212 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 11.18 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)

= 64.45 + 5.33 + 12.00 * 2.31 = 97.50

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000116 FT/MIN

K = .00000059 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00078693 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 11.18 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)

= 64.45 + 8.69 + .00 * 2.31 = 73.14

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000065 FT/MIN

K = .00000033 CM/SEC

PACKER TEST ANALYSIS

WELL NO. 25-86

ROCKY FLATS PLANT JOB NO. 106PO6222

DATE TESTED: 9/06/86 BY: T. GULLIVER

TEST INTERVAL (FEET BELOW G.S.): 69.36 - 80.54

MATERIAL TESTED: ARAPAHOE SANDSTONE

DEPTH TO WATER (FEET BELOW G.S.): 69.92

$$K = \frac{Q}{2(PI)(L)(H)} \ln\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00006092 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 11.18 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 74.95 + 10.67 + .00 * 2.31 = 85.62

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000004 FT/MIN

K = .00000002 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00993387 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 11.18 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 74.95 + 5.33 + 15.00 * 2.31 = 114.93

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000521 FT/MIN

K = .00000265 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00213231 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 11.18 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 74.95 + 10.06 + .00 * 2.31 = 85.01

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000151 FT/MIN

K = .00000077 CM/SEC

PACKER TEST ANALYSIS
WELL NO. 25-86
ROCKY FLATS PLANT JOB NO. 106PO6222
DATE TESTED: 9/06/86 BY: T. GULLIVER
TEST INTERVAL (FEET BELOW G.S.): 83.29 - 94.47
MATERIAL TESTED: ARAPAHOE CLAYSTONE
DEPTH TO WATER (FEET BELOW G.S.): 69.92

$$K = \frac{Q}{2(\pi)(L)(H)} \ln\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00038077 (FEET³/MIN)
L = LENGTH OF TEST INTERVAL = 11.18 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 69.92 + 10.60 + .00 * 2.31 = 80.52
R = BOREHOLE RADIUS = .16 FEET
K = HYDRAULIC CONDUCTIVITY = .00000029 FT/MIN
K = .00000014 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00782772 (FEET³/MIN)
L = LENGTH OF TEST INTERVAL = 11.18 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 69.92 + 5.33 + 18.90 * 2.31 = 118.91
R = BOREHOLE RADIUS = .16 FEET
K = HYDRAULIC CONDUCTIVITY = .00000397 FT/MIN
K = .00000202 CM/SEC

2ND P1/3 TEST

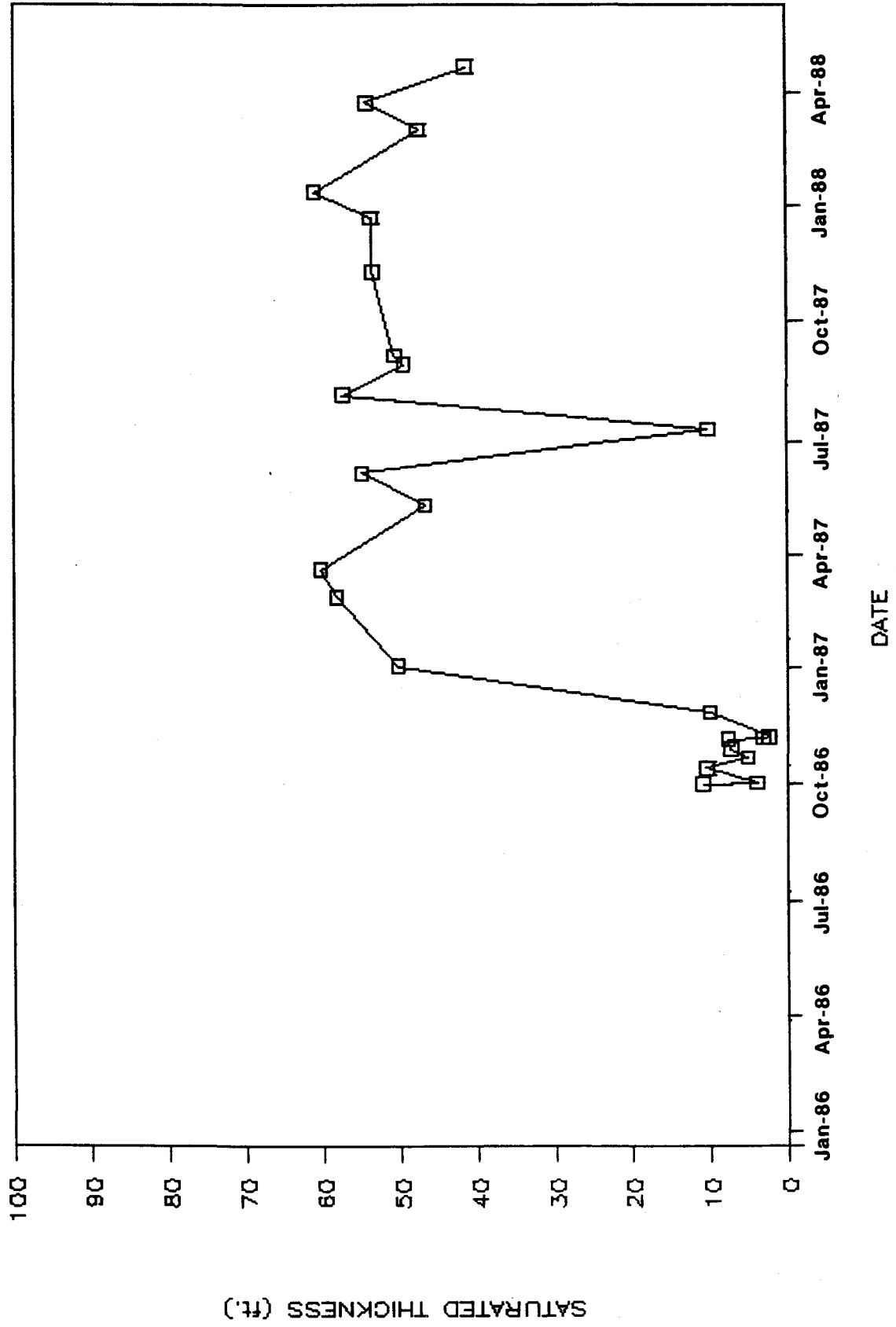
Q = INJECTION RATE = .00811115 (FEET³/MIN)
L = LENGTH OF TEST INTERVAL = 11.18 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 69.92 + 10.20 + .00 * 2.31 = 80.12
R = BOREHOLE RADIUS = .16 FEET
K = HYDRAULIC CONDUCTIVITY = .00000611 FT/MIN
K = .00000310 CM/SEC

ROCKY FLATS SOLAR PONDS

WATER LEVEL SUMMARY

| <u>WELL</u> <u>NUMBER</u> | <u>DATE</u> | <u>GROUND</u> <u>SURFACE</u> <u>ELEVATION</u> | <u>TOP OF</u> <u>CASING</u> <u>ELEVATION</u> | <u>STICK</u> <u>UP</u> | <u>DEPTH</u> <u>OF SI</u> <u>BASE</u> | <u>WATER</u> <u>DEPTH</u> <u>BELOW TOC</u> | <u>WATER</u> <u>SURFACE</u> <u>ELEVATION</u> |
|------------------------------|-------------|---|--|---------------------------|---|--|--|
| 2586 | 09/30/86 | 5974.45 | 5976.55 | 2.10 | 82.00 | 71.05 | 5905.50 |
| | 10/01/86 | | | | | 77.93 | 5898.62 |
| | 10/13/86 | | | | | 71.42 | 5905.13 |
| | 10/21/86 | | | | | 76.73 | 5899.82 |
| | 10/28/86 | | | | | 74.59 | 5901.96 |
| | 11/05/86 | | | | | 74.24 | 5902.31 |
| | 11/06/86 | | | | | 78.65 | 5897.90 |
| | 11/07/86 | | | | | 79.52 | 5897.03 |
| | 11/26/86 | | | | | 71.94 | 5904.61 |
| | 01/01/87 | | | | | 31.83 | 5944.72 |
| | 02/25/87 | | | | | 23.92 | 5952.63 |
| | 03/18/87 | | | | | 21.75 | 5954.80 |
| | 05/08/87 | | | | | 35.38 | 5941.17 |
| | 06/03/87 | | | | | 27.25 | 5949.30 |
| | 07/08/87 | | | | | 71.70 | 5904.85 |
| | 08/04/87 | | | | | 24.70 | 5951.85 |
| | 08/27/87 | | | | | 32.60 | 5943.95 |
| | 09/03/87 | | | | | 31.40 | 5945.15 |
| | 11/09/87 | | | | | 28.60 | 5947.95 |
| | 12/21/87 | | | | | 28.40 | 5948.15 |
| | 01/11/88 | | | | | 21.00 | 5955.55 |
| | 02/29/88 | | | | | 34.60 | 5941.95 |
| | 03/21/88 | | | | | 27.80 | 5948.75 |
| | 04/18/88 | | | | | 40.70 | 5935.85 |

SATURATED THICKNESS IN WELL # 25-86 (SP)



INDEX OF DATA

Boring No.: 26-86

Completed as well? Yes

Data in File

- X Log of Borehole
- X Well Construction Summaries
- Well Development Summaries
- X Hydraulic Conductivity Test Data
and Results
- Packer Test Data and Results
- X Water Level Data
- X Saturated Thickness Hydrographs

Project: Rocky Flats Plant

LOG OF BORING NO. 26-86

Date Drilled 8/22/86

Coordinates N 37425.8 E 21737.2

Boring Method Hollow Stem Auger

Ground Surface Elevation 5974.48

| Elev. (feet) | Depth (feet) | Sample Type | Graphic Log | Material Description | Penetration Resistance (Blows/Inch) 20 40 | Water Content (%) 20 40 | Other Tests |
|-----------------|-----------------|----------------|----------------|---|--|----------------------------------|----------------|
| | 0 | | | ARTIFICIAL FILL 0-1.5'-Sample. Recovered 1.3/1.5'=87%. GRAVEL: light brown (5YR 6/4) granite and quartzite pebbles and cobbles; sandy; poorly sorted; angular to subangular; dry. 1.5-4.0'-Sample. Recovered 0/2.5'=0%. 4.0-7.0'-Sample. Recovered 2.6/3.0'=87%. 4.0-4.5'. Same as above; dry. 4.5-7.0'. SAND: very pale orange (10YR 8/2) to grayish orange (10YR 7/4); very coarse to fine- grained; some granite and quartzite pebbles and cobbles; silty; grades into dark yellow orange (10YR 6/6) sand at base of sample; bedding apparent due to size variation; poorly sorted; subangular to angular; damp. 7.0-9.0'-Sample. Recovered 0.0/2.0'=0%. 9.0-12.0'-Sample. Recovered 3.0/3.0'=100%. 9.0-9.5'. Same as above; damp. | | | |
| | 2.5 | | | | | | |
| | 5 | | | | | | |
| | 7.5 | | | | | | |
| | 10 | | | ARAPAHOE FORMATION 9.5-12.0'. CLAYSTONE: light olive brown (5Y 5/6); some silt; trace sand; sand layers from 10.4-10.7' and 11.4-11.6'; sand is very pale orange (10YR 8/2); coarse- grained; moderately sorted; subangular; trace calcareous cement; unconsolidated; soft; wet; clay is firm; moist. | | | |

Remarks

Logged by: T. Murphy

Checked by: 

Project No.

106P06222

Hydro-Search, Inc.

Page 1 of 2

Project: Rocky Flats Plant

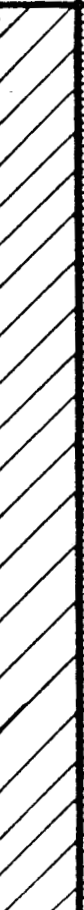
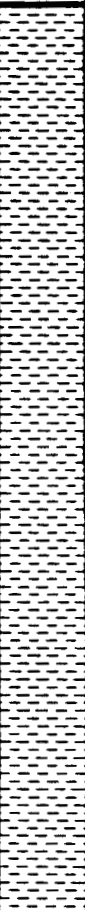

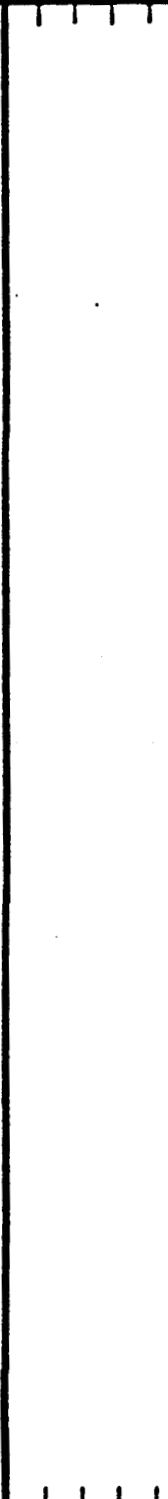



LOG OF BORING NO. 26-86

Date Drilled 8/22/86

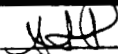
Coordinates N 37425.8 E 21737.2

Boring Method Hollow Stem Auger

Ground Surface Elevation 5974.48

| Elev. (feet) | Depth (feet) | Sample Type | Graphic Log | Material Description | Penetration Resistance (Blows/Inch) | | Water Content (%) | | Other Tests |
|-----------------|-----------------|--|--|--|--|--|--|--|--|
| | | | | | 20 | 40 | 20 | 40 | |
| | 10 |  |  | 12.0-17.0'-Sample. Recovered 5.0/5.0'=100%. CLAYSTONE: medium dark gray (N4) with grayish orange (10YR 7/4) and pale olive (10YR 6/2) mottling; some silt with very coarse-grained sand lenses less than 0.2' thick; ironstone layer at 12.9-13.2' with calcareous cement; firm; moist. |  |  |  |  |  |
| | 12.5 | | | | | | | | |
| | 15 | | | | | | | | |
| | 17.5 | | | | | | | | |
| | 20 | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | TOTAL DEPTH: 17.0' | | | | | |

Remarks Logged by: T. Murphy

Checked by: Project No.
106P06222

Hydro-Search, Inc.

Page 2 of 2

WELL CONSTRUCTION SUMMARY

 LOCATION or COORDS: _____
 N 37425.8 E 21737.2

 ELEVATION: GROUND LEVEL 5974.48'
 TOP OF CASING 5976.49'

DRILLING SUMMARY:

 TOTAL DEPTH Well: 11.00' Hole: 17.00'
 BOREHOLE DIAMETER 7½"
 DRILLER Boyles Brothers Drilling Co.
 15865 W. 5th Avenue
 Golden, CO (Dave Jarvie)
 RIG Mobile B-57
 BIT(S) Blade bit
 DRILLING FLUID None
 SURFACE CASING 5" x 5' steel w/ locking cap

WELL DESIGN:

 BASIS: GEOLOGIC LOG X GEOPHYSICAL LOG _____
 CASING STRING(S): C-CASING S-SCREEN

| | | | |
|-------|--------|----|---|
| 0.00' | 3.75' | C1 | - |
| 3.75' | 11.00' | S1 | - |
| - | - | - | - |
| - | - | - | - |
| - | - | - | - |
| - | - | - | - |
| - | - | - | - |
| - | - | - | - |
| - | - | - | - |
| - | - | - | - |

CASING: C1 2" I.D. Sch. 5 type 316 stainless steel, threaded and flush jointed.

 SCREEN: S1 2" I.D. Sch. 5 type 316 stainless steel, threaded and flush jointed, 0.010" wire wrap screen
 0.25' welded bottom cap.

 CENTRALIZERS Type 304 stainless steel
 6.80' - 8.00'

 FILTER MATERIAL 32-42 silica sand
 3.10' - 12.20'

 CEMENT Portland Type I
 0.00' - 2.20'

 OTHER 3/8" bentonite pellets
 2.20' - 3.10'
 12.20' - 15.50'

CONSTRUCTION TIME LOG:

| TASK | START | | FINISH | |
|-------------------|-------|------|--------|------|
| | DATE | TIME | DATE | TIME |
| DRILLING: | 1986 | | 1986 | |
| 7½" auger | 8/22 | 1235 | 8/22 | 1400 |
| | | | | |
| | | | | |
| GEOPHYS. LOGGING: | - | - | - | - |
| CASING: | | | | |
| 2" stainless | 8/22 | 1555 | 8/22 | 1556 |
| | | | | |
| | | | | |
| FILTER PLACEMENT: | 8/22 | 1556 | 8/22 | 1504 |
| CEMENTING: | 8/22 | 1607 | 8/22 | 1611 |
| DEVELOPMENT: | 9/12 | 1415 | 9/17 | 1110 |
| OTHER: | | | | |
| Bentonite | 8/22 | 1604 | 8/22 | 1602 |
| | 8/22 | 1550 | 8/22 | 1555 |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

WELL DEVELOPMENT

See Well Development Summary Sheet.

COMMENTS:

Water encountered at 9.46', recorded 1 day after well completed.

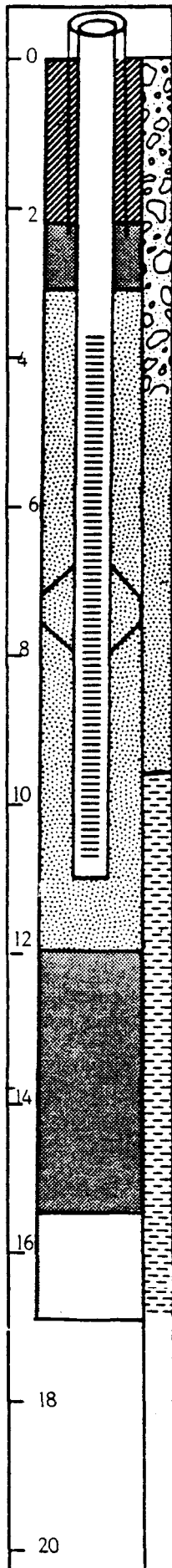
Top of stainless steel casing: 2.01'

Cave from TD to 15.50'

 LOCATION Golden, CO
 PERSONNEL T. Murphy

 PROJECT 106P06222
 Rocky Flats Plant

PROJECT



CLIENT/SUBJECT _____ W.O. NO. _____

TASK DESCRIPTION _____ TASK NO. _____

| | | | |
|----------------------|------------|------------|-----------------------|
| PREPARED BY _____ | DEPT _____ | DATE _____ | APPROVED BY _____ |
| MATH CHECK BY _____ | DEPT _____ | DATE _____ | _____ |
| METHOD REV. BY _____ | DEPT _____ | DATE _____ | DEPT _____ DATE _____ |

WELL 26-86

Hydraulic Conductivity (cm/sec) = 4×10^{-8}

Static Water Level (ft below G.L.) = 3.95'

Screened Interval (ft below G.L.) = 3.75 - 11.00'

3.75 - 4.5 gravel

4.5 - 9.5 sand

9.5 - 11.00 claystone

Method of Analysis : (Bouwer, 1978)

08:37:08.34

BAILDOWN - RECOVERY ANALYSIS FOR WELL 26-86

MON 06-20-1
1985

RAW DATA

WELL # 26-86

WELL DIAMETER= 7.25 INCHES

CASING DIAMETER= 2.00 INCHES

VOLUME OF WATER= .75 GALLONS

LENGTH OF AQUIFER TESTED= 7.05 FEET

VALUE OF H_0 = 6.85 FEET*

STATIC WATER LEVEL= 3.95 FEET

LENGTH OF SCREEN= 7.25 FEET

WATER TABLE TO BOTTOM OF WELL= 7.05 FEET

* The H_0 calculated for a recovery of 0.75 gallons is 4.60 feet. Because this is less than the first residual drawdown recorded (6.85 feet) at $T=15.5$ minutes, H_0 has been set at 6.85 feet for this analysis.

| TIME | WATER LEVEL (FEET) | TIME SINCE TEST BEGAN (MINUTES) |
|----------|-----------------------|------------------------------------|
| 12. 5.30 | 10.80 | 15.50 |
| 12. 6. 0 | 10.60 | 16.00 |
| 12. 6.30 | 10.51 | 16.50 |
| 12. 7. 0 | 10.45 | 17.00 |
| 12. 7.30 | 10.38 | 17.50 |
| 12. 8. 0 | 10.35 | 18.00 |
| 12. 8.30 | 10.30 | 18.50 |
| 12. 9. 0 | 10.25 | 19.00 |
| 12. 9.30 | 10.22 | 19.50 |
| 12.10. 0 | 10.08 | 20.00 |
| 12.11. 0 | 10.05 | 21.00 |
| 12.12. 0 | 10.02 | 22.00 |
| 12.13. 0 | 9.94 | 23.00 |
| 12.14. 0 | 9.90 | 24.00 |
| 12.15. 0 | 9.90 | 25.00 |
| 12.16. 0 | 9.84 | 26.00 |
| 12.17. 0 | 9.82 | 27.00 |
| 12.18. 0 | 9.82 | 28.00 |
| 12.19. 0 | 9.74 | 29.00 |
| 12.20. 0 | 9.69 | 30.00 |
| 12.22. 0 | 9.65 | 32.00 |
| 12.24. 0 | 9.62 | 34.00 |
| 12.26. 0 | 9.59 | 36.00 |
| 12.28. 0 | 9.50 | 38.00 |
| 12.30. 0 | 9.50 | 40.00 |
| 12.32. 0 | 9.45 | 42.00 |
| 12.34. 0 | 9.45 | 44.00 |
| 12.36. 0 | 9.44 | 46.00 |
| 12.38. 0 | 9.41 | 48.00 |
| 12.40. 0 | 9.41 | 50.00 |
| 12.45. 0 | 9.39 | 55.00 |
| 12.50. 0 | 9.34 | 60.00 |
| 12.55. 0 | 9.31 | 65.00 |
| 13. 0. 0 | 9.26 | 70.00 |
| 13. 5. 0 | 9.23 | 75.00 |
| 13.10. 0 | 9.22 | 80.00 |
| 13.15. 0 | 9.18 | 85.00 |
| 13.20. 0 | 9.15 | 90.00 |
| 13.25. 0 | 9.14 | 95.00 |
| 13.35. 0 | 9.11 | 105.00 |

| | | |
|----------|------|---------|
| 10.45. 0 | 8.90 | 115.00 |
| 13.55. 0 | 9.02 | 125.00 |
| 14. 5. 0 | 9.00 | 135.00 |
| 14.15. 0 | 8.99 | 145.00 |
| 14.25. 0 | 8.99 | 155.00 |
| 14.35. 0 | 8.98 | 165.00 |
| 14.45. 0 | 8.96 | 175.00 |
| 14.55. 0 | 8.96 | 185.00 |
| 15. 5. 0 | 8.96 | 195.00 |
| 15.20. 0 | 8.93 | 210.00 |
| 15.35. 0 | 8.92 | 225.00 |
| 32.12. 0 | 8.82 | 1222.00 |
| 37.26. 0 | 8.75 | 1536.00 |
| 61.33. 0 | 8.78 | 2983.00 |
| ***43. 0 | 8.93 | 7013.00 |
| ***20. 0 | 8.90 | 7410.00 |
| ***19. 0 | 8.97 | 8429.00 |
| ***38. 0 | 8.90 | 8808.00 |

08:37:16.25

BAILDOWN - RECOVERY ANALYSIS FOR WELL 26-86

MON 06-20-1

WELL # 26-86

WELL DIAMETER= 7.25 INCHES

CASING DIAMETER= 2.00 INCHES

VOLUME OF WATER REMOVED OR ADDED TO WELL= .75 GALLONS

LENGTH OF AQUIFER TESTED= 7.05 FEET

VALUE OF H0= 6.85 FEET

STATIC WATER LEVEL= 3.95 FEET

SLUG TEST DATA:

| TIME SINCE TEST BEGAN (MINUTES) | WATER LEVEL (FEET) | DRAWDOWN (FEET) | HEAD RATIO | RECIPROCAL TIME (1/MINUTES) |
|------------------------------------|-----------------------|--------------------|------------|--------------------------------|
| 15.50 | 10.80 | 6.85 | 1.000 | .065 |
| 16.00 | 10.60 | 6.65 | .971 | .063 |
| 16.50 | 10.51 | 6.56 | .958 | .061 |
| 17.00 | 10.45 | 6.50 | .949 | .059 |
| 17.50 | 10.38 | 6.43 | .939 | .057 |
| 18.00 | 10.35 | 6.40 | .934 | .056 |
| 18.50 | 10.30 | 6.35 | .927 | .054 |
| 19.00 | 10.25 | 6.30 | .920 | .053 |
| 19.50 | 10.22 | 6.27 | .915 | .051 |
| 20.00 | 10.08 | 6.13 | .895 | .050 |
| 21.00 | 10.05 | 6.10 | .891 | .048 |
| 22.00 | 10.02 | 6.07 | .886 | .045 |
| 23.00 | 9.94 | 5.99 | .874 | .043 |
| 24.00 | 9.90 | 5.95 | .869 | .042 |
| 25.00 | 9.90 | 5.95 | .869 | .040 |
| 26.00 | 9.84 | 5.89 | .860 | .038 |
| 27.00 | 9.82 | 5.87 | .857 | .037 |
| 28.00 | 9.82 | 5.87 | .857 | .036 |
| 29.00 | 9.74 | 5.79 | .845 | .034 |
| 30.00 | 9.69 | 5.74 | .838 | .033 |
| 32.00 | 9.65 | 5.70 | .832 | .031 |
| 34.00 | 9.62 | 5.67 | .828 | .029 |
| 36.00 | 9.59 | 5.64 | .823 | .028 |
| 38.00 | 9.50 | 5.55 | .810 | .026 |
| 40.00 | 9.50 | 5.55 | .810 | .025 |
| 42.00 | 9.45 | 5.50 | .803 | .024 |
| 44.00 | 9.45 | 5.50 | .803 | .023 |
| 46.00 | 9.44 | 5.49 | .801 | .022 |
| 48.00 | 9.41 | 5.46 | .797 | .021 |
| 50.00 | 9.41 | 5.46 | .797 | .020 |
| 55.00 | 9.39 | 5.44 | .794 | .018 |
| 60.00 | 9.34 | 5.39 | .787 | .017 |
| 65.00 | 9.31 | 5.36 | .782 | .015 |
| 70.00 | 9.26 | 5.31 | .775 | .014 |
| 75.00 | 9.23 | 5.28 | .771 | .013 |
| 80.00 | 9.22 | 5.27 | .769 | .013 |
| 85.00 | 9.18 | 5.23 | .764 | .012 |
| 90.00 | 9.15 | 5.20 | .759 | .011 |
| 95.00 | 9.14 | 5.19 | .758 | .011 |
| 105.00 | 9.11 | 5.16 | .753 | .010 |
| 115.00 | 9.06 | 5.11 | .746 | .009 |
| 125.00 | 9.02 | 5.07 | .740 | .008 |
| 135.00 | 9.00 | 5.05 | .737 | .007 |
| 145.00 | 8.99 | 5.04 | .736 | .007 |

| | | | | |
|---------|------|------|------|------|
| 165.00 | 8.98 | 5.03 | .734 | .006 |
| 175.00 | 8.96 | 5.01 | .731 | .006 |
| 185.00 | 8.96 | 5.01 | .731 | .005 |
| 195.00 | 8.96 | 5.01 | .731 | .005 |
| 210.00 | 8.93 | 4.98 | .727 | .005 |
| 225.00 | 8.92 | 4.97 | .726 | .004 |
| 1222.00 | 8.82 | 4.87 | .711 | .001 |
| 1536.00 | 8.75 | 4.80 | .701 | .001 |
| 2983.00 | 8.78 | 4.83 | .705 | .000 |
| 7013.00 | 8.93 | 4.98 | .727 | .000 |
| 7410.00 | 8.90 | 4.95 | .723 | .000 |
| 8429.00 | 8.97 | 5.02 | .733 | .000 |
| 8808.00 | 8.90 | 4.95 | .723 | .000 |

08:37:23.83

BAILDOWN - RECOVERY ANALYSIS FOR WELL 26-86

MON 06-20-1988

WELL # 26-86

PERMEABILITY BASED ON COOPER, BREDEHOEFT, AND PAPADOPULOS METHOD

PERMEABILITY=5.00E-04/ MATCH TIME (IN MINUTES)
STORAGE COEF= 7.61E-02* ALPHA
COMPUTER CALCULATES
ALPHA= .10 MATCH TIME= 1.52E+03
PERMEABILITY= 3.29E-07 CM/SEC
STORAGE COEF=7.61E-03
CORRELATION NUMBER= .98

PERMEABILITY BASED ON REGRESSION FIT OF HEAD RATIO DATA

HVORSLEV PERMEABILITY=7.88E-04 / LAG TIME
BOUWER PERMEABILITY=1.30E-03 * -SLOPE

COMPUTER CALCULATES
PERMEABILITY VARIES MORE THAN 20% DEPENDING ON THE EQUATION

FOR X ON Y: HVORSLEV PERMEABILITY=1.68E-08 CM/SEC
BOUWER PERMEABILITY=9.45E-09 CM/SEC
FOR Y ON X: HVORSLEV PERMEABILITY=1.02E-07 CM/SEC
BOUWER PERMEABILITY=6.20E-08 CM/SEC
AVERAGE HVORSLEV PERMEABILITY=2.89E-08 CM/SEC
AVERAGE BOUWER PERMEABILITY=3.57E-08 CM/SEC
REGRESSION STATISTICS

X ON Y
INTERCEPT= -.09
SLOPE=-7.26E-06

Y ON X
INTERCEPT= -.06
SLOPE=-4.76E-05

CORRELATION COEFFICIENT= -.39

CALCULATIONS INDICATE THAT A VALUE OF 8.70 FEET FOR HO
OR A VALUE OF 1.774 INCHES FOR EFFECTIVE CASING DIA.
MAY YIELD BETTER RESULTS

PERMEABILITY BASED ON REGRESSION FIT OF DATA - FERRIS & KNOWLES METHOD

PERMEABILITY=5.74E-04 / SLOPE
PERMEABILITY=2.11E-05 CM/SEC
REGRESSION STATISTICS

X ON Y
INTERCEPT= 4.88
SLOPE= 2.71E+01

Y ON X
INTERCEPT= 4.88

SLOPE= 2.74E+01
CORRELATION COEFFICIENT= .99

08:38:22.87

BAILDOWN - RECOVERY ANALYSIS FOR WELL 26-86

MON 06-20-19

| WELL # | PERMEABILITY METHOD 1 | PERMEABILITY METHOD 2 | STORAGE COEF METHOD 2 | PERMEABILITY METHOD 3 | PERMEABILITY METHOD 4 |
|--------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| 26-86 | 2.89E-08 | 3.29E-07 | 7.61E-03 | 2.11E-05 | 3.57E-08 |

* METHOD 1 IS HVORSLEV
METHOD 2 IS COOPER, BREDEHOEFT, AND PAPADOPULOS
METHOD 3 IS FERRIS AND KNOWLES
METHOD 4 IS BOUWER

AQUIFER TEST DATA

TYPE OF AQUIFER TEST hail down rec. test
 HOW Q MEASURED 4 gall bucket
 HOW W.L.'s MEASURED Olympic
 RAD./DIST. OF/FROM PUMPING WELL 1"
 MEAS. POINT FOR W.L.'s _____
 ELEVATION OF MEAS. POINT su = 2.3

WELL 26-86
 PUMPING or OBSERVATION WELL
 PUMPING or RECOVERY DATA
 PAGE _____ OF _____

DEPTH OF PUMP/AIRPIPE _____
 PUMP ON: date 11/12/86 time 11:50
 PUMP OFF: date 11/12/86 time 12:04
 DURATION OF AQUIFER TEST _____

LOCATION
PERSONNEL

PROJECT

| TIME | | | | WATER LEVEL DATA | | | | DISCHARGE | RECORDED BY | COMMENTS |
|---------------------|------------|-----|----|----------------------------------|---------------------------|------------------|-----------------|-----------|-------------|--------------------------|
| t = _____ at t' = 0 | | | | STATIC WATER LEVEL <u>5+1.25</u> | | | | | | |
| DAY | CLOCK TIME | t | t' | READING | CONVERSIONS & CORRECTIONS | WATER LEVEL | s or s' | READING | Q | TD 13.33 |
| | 1205 | | | 10+2.30 | 2.30 | 10.80 | 6.85 | | | CW 1150 STARTED RAIN |
| | 1205.5 | | | 10+3.1 | 2.30 | 10.80 | 6.85 | | | 1209 STARTED RAIN |
| | 1206 | 1.0 | | 10+2.9 | 2.30 | 10.60 | 6.65 | | | 1.75 - ANT BIRD |
| | 1206.5 | 1.5 | | 10+2.81 | | 10.51 | 6.56 | | | |
| | 1207 | 2.0 | | 10+2.75 | | 10.45 | 6.5 | | | |
| | 1207.5 | 2.5 | | 10+2.68 | | 10.38 | 6.43 | | | |
| | 1208 | 3.0 | | 10+2.65 | | 10.35 | 6.4 | | | |
| | 1208.5 | 3.5 | | 10+2.60 | | 10.30 | 6.35 | | | (READING) 90% Rec. = 6.9 |
| | 1209 | 4.0 | | 10+2.55 | | 10.25 | 6.30 | | | |
| | 1209.5 | 4.5 | | 10+2.50 | | 10.22 | 6.27 | | | |
| | 1210 | 5 | | 10+2.38 | | 10.08 | 6.13 | | | |
| | 1211 | 6 | | 10+2.35 | | 10.05 | 6.1 | | | |
| | 1212 | 7 | | 10+2.32 | | 10.02 | 6.07 | | | |
| | 1213 | 8 | | 10+2.24 | | 9.94 | 5.99 | | | |
| | 1214 | 9 | | 10+2.2 | | 9.90 | 5.95 | | | |
| | 1215 | 10 | | 10+2.2 | | 9.90 | 5.95 | | | |
| | 1216 | 11 | | 10+2.14 | | 9.84 | 5.89 | | | |
| | 1217 | 12 | | 10+2.12 | | 9.82 | 5.87 | | | |
| | 1218 | 13 | | 10+2.12 | | 9.82 | 5.87 | | | |
| | 1219 | 14 | | 10+2.04 | | 9.74 | 5.79 | | | |
| | 1220 | 15 | | 10+1.99 | | 9.69 | 5.74 | | | |
| | 1222 | 17 | | 10+1.95 | | 9.65 | 5.7 | | | |
| | 1224 | 19 | | 10+1.92 | | 9.62 | 5.67 | | | |
| | 1226 | 21 | | 10+1.89 | | 9.59 | 5.64 | | | |
| | 1228 | 23 | | 10+1.80 | | 9.50 | 5.55 | | | |
| | 1230 | 25 | | 10+1.80 | | 9.50 | 5.55 | | | |
| | 1232 | 27 | | 10+1.75 | | 9.45 | 5.50 | | | |
| | 1234 | 29 | | 10+1.75 | | 9.45 | 5.50 | | | |
| | 1236 | 31 | | 10+1.74 | | 9.44 | 5.49 | | | |
| | 1238 | 33 | | 10+1.71 | | 9.41 | 5.46 | | | |
| | 1240 | 35 | | 10+1.71 | | 9.41 | 5.46 | | | |
| | 1245 | 40 | | 10+1.69 | | 9.39 | 5.44 | | | |
| | 1250 | 45 | | 10+1.64 | | 9.34 | 5.39 | | | |
| | 1255 | 50 | | 10+1.61 | | 9.31 | 5.36 | | | |
| | 1300 | 55 | | 10+1.56 | | 9.26 | 5.31 | | | |
| | 1305 | 60 | | 10+1.53 | | 9.23 | 5.28 | | | |
| | 1310 | 65 | | 10+1.52 | | 9.22 | 5.27 | | | |
| | 1315 | 70 | | 10+1.48 | | 9.18 | 5.23 | | | |
| | 1320 | 75 | | 10+1.45 | | 9.15 | 5.20 | | | |
| | 1325 | 80 | | 10+1.44 | | 9.14 | 5.19 | | | |
| | 1335 | 90 | | 10+1.41 | | 9.11 | 5.16 | | | |

AQUIFER TEST DATA

WELL 26-86
 PUMPING or OBSERVATION WELL
 PUMPING or RECOVERY DATA
 PAGE _____ OF _____

TYPE OF AQUIFER TEST _____
 HOW Q MEASURED _____
 HOW W.L.'s MEASURED _____
 RAD./DIST. OF/FROM PUMPING WELL _____
 MEAS. POINT FOR W.L.'s _____
 ELEVATION OF MEAS. POINT _____

DEPTH OF PUMP/AIRPIPE _____
 PUMP ON: date _____ time _____
 PUMP OFF: date _____ time _____
 DURATION OF AQUIFER TEST _____

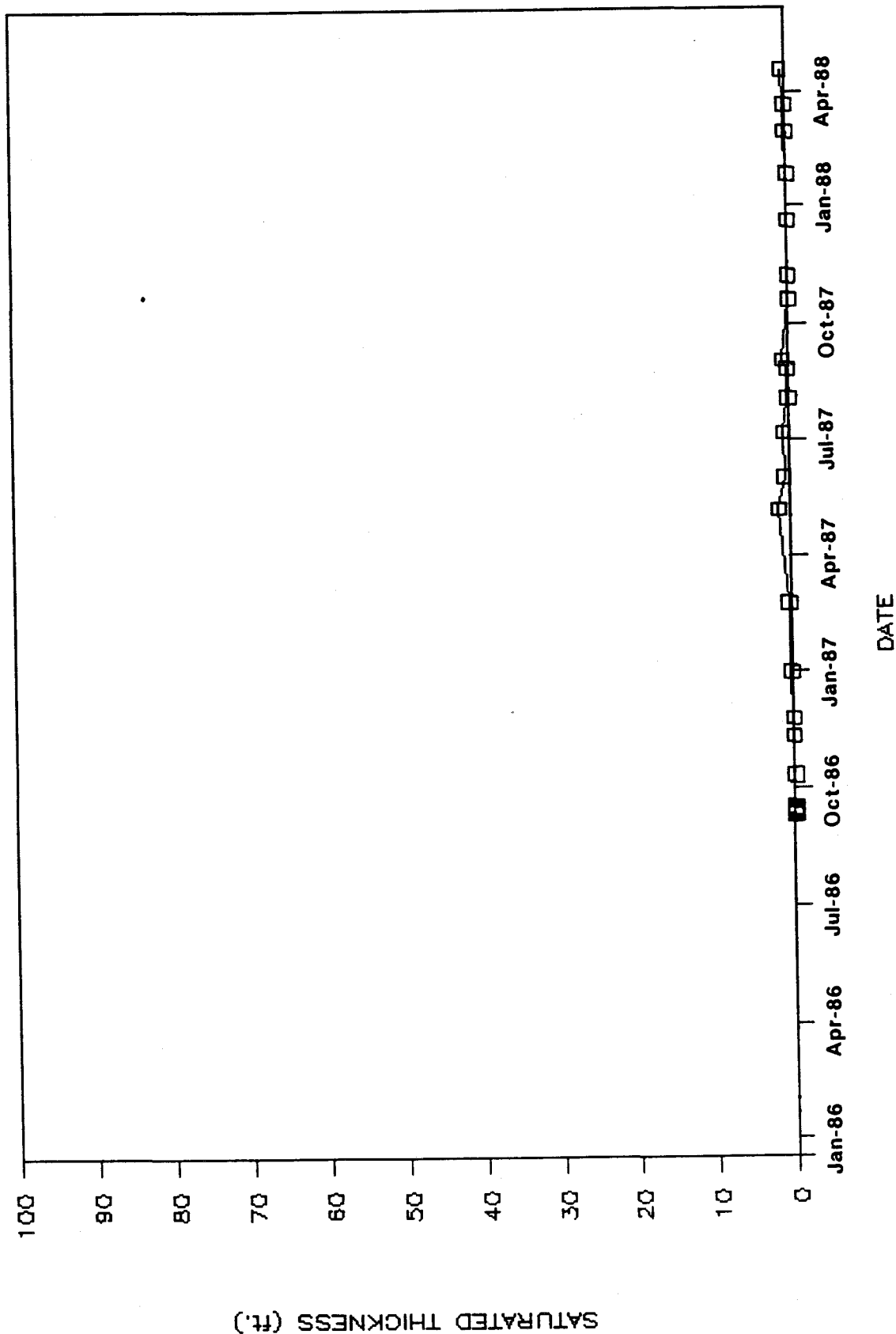
| TIME | | | | WATER LEVEL DATA | | | | | DISCHARGE | | RECORDED BY | COMMENTS |
|---------------------|------------|-----|----|---------------------------------|------------------------|-------------|---------|--|-----------|---|-------------|----------|
| t = _____ at t' = 0 | | | | STATIC WATER LEVEL <u>5+125</u> | | | | | | | | |
| DAY | CLOCK TIME | t | t' | READING | CONVERSION CORRECTIONS | WATER LEVEL | s or s' | | READING | Q | | |
| | 1345 | 100 | | 10+1.36 | 2.30 | 8.06 | 5.11 | | | | au | |
| | 1355 | 110 | | 10+1.325 | " | 8.02 | 5.07 | | | | | |
| | 1405 | 120 | | 10+1.305 | | 8.00 | 5.05 | | | | | |
| | 1415 | 130 | | 10+1.29 | | 8.99 | 5.04 | | | | | |
| | 1425 | 140 | | 10+1.29 | | 8.99 | 5.04 | | | | | |
| | 1435 | 150 | | 10+1.28 | | 8.98 | 5.03 | | | | | |
| | 1445 | 160 | | 10+1.26 | | 8.96 | 5.01 | | | | | |
| | 1455 | 170 | | 10+1.26 | | 8.96 | 5.01 | | | | | |
| | 1505 | 180 | | 10+1.26 | | 8.96 | 5.01 | | | | | |
| 1 | 1520 | 195 | | 10+1.23 | | 8.93 | 4.98 | | | | | |
| 1 | 1535 | 210 | | 10+1.22 | | 8.92 | 4.97 | | | | | |
| 2 | 8:12 | | | 10+1.12 | | 8.82 | 4.87 | | | | | |
| 2 | 13:26 | | | 10+1.05 | | 8.75 | 4.80 | | | | | |
| 3 | 13:33 | | | 10+1.08 | | 8.78 | 4.83 | | | | | |
| 6 | 8:43 | | | 10+1.23 | | 8.93 | 4.98 | | | | | |
| 6 | 15:20 | | | 10+1.20 | | 8.90 | 4.95 | | | | | |
| 7 | 8:19 | | | 10+1.27 | | 8.97 | 5.02 | | | | | |
| 7 | 14:38 | | | 10+1.20 | | 8.90 | 4.95 | | | | | |
| ENOUGH DARBELL SAYS | | | | | | | | | | | | |

ROCKY FLATS SOLAR PONDS

WATER LEVEL SUMMARY

| <u>WELL</u> <u>NUMBER</u> | <u>DATE</u> | <u>GROUND</u> <u>SURFACE</u> <u>ELEVATION</u> | <u>TOP OF</u> <u>CASING</u> <u>ELEVATION</u> | <u>STICK</u> <u>UP</u> | <u>DEPTH</u> <u>OF SI</u> <u>BASE</u> | <u>WATER</u> <u>DEPTH</u> <u>BELOW TOC</u> | <u>WATER</u> <u>SURFACE</u> <u>ELEVATION</u> |
|------------------------------|-------------|---|--|---------------------------|---|--|--|
| 2686 | 01/27/86 | 5974.48 | 5976.49 | 2.01 | 11.00 | 11.60 | 5964.89 |
| | 09/12/86 | | | | | 11.34 | 5965.15 |
| | 09/13/86 | | | | | 11.54 | 5964.95 |
| | 09/15/86 | | | | | 11.45 | 5965.04 |
| | 09/16/86 | | | | | 11.63 | 5964.86 |
| | 09/17/86 | | | | | 11.64 | 5964.85 |
| | 09/18/86 | | | | | 11.67 | 5964.82 |
| | 10/13/86 | | | | | 11.86 | 5964.63 |
| | 11/12/86 | | | | | 11.60 | 5964.89 |
| | 11/26/86 | | | | | 11.32 | 5965.17 |
| | 01/01/87 | | | | | 10.71 | 5965.78 |
| | 02/25/87 | | | | | 10.54 | 5965.95 |
| | 05/08/87 | | | | | 9.48 | 5967.01 |
| | 06/03/87 | | | | | 10.25 | 5966.24 |
| | 07/08/87 | | | | | 10.20 | 5966.29 |
| | 08/04/87 | | | | | 10.80 | 5965.69 |
| | 08/27/87 | | | | | 10.70 | 5965.79 |
| | 09/03/87 | | | | | 10.20 | 5966.29 |
| | 10/21/87 | | | | | 11.50 | 5964.99 |
| | 11/09/87 | | | | | 11.60 | 5964.89 |
| | 12/21/87 | | | | | 11.60 | 5964.89 |
| | 01/27/88 | | | | | 11.60 | 5964.89 |
| | 02/29/88 | | | | | 10.80 | 5965.69 |
| | 03/21/88 | | | | | 10.70 | 5965.79 |
| | 04/18/88 | | | | | 10.40 | 5966.09 |

SATURATED THICKNESS IN WELL # 26-86 (SP)



INDEX OF DATA

Boring No.: 27-86

Completed as well? Yes

Data in File

- X Log of Borehole
- X Well Construction Summaries
- Well Development Summaries
- X Hydraulic Conductivity Test Data
and Results
- X Packer Test Data and Results
- X Water Level Data
- X Saturated Thickness Hydrographs

Project: Rocky Flats Plant

LOG OF BORING NO. 27-86

Date Drilled 8/29/86 and 9/12/86 to 9/18/86

Coordinates N 37794.1 E 22134.9

Boring Method Hollow Stem Auger/NC Core

Ground Surface Elevation 5961.86

| Elev. (feet) | Depth (feet) | Sample Type | Graphic Log | Material Description | Penetration Resistance (Blows/Inch) | | Water Content (%) | | Other Tests |
|-----------------|-----------------|----------------|----------------|--|---|----|-------------------------|----|----------------|
| | | | | | 20 | 40 | 20 | 40 | |
| | 0 | | | ARTIFICIAL FILL | | | | | |
| | | | | 0-2.0'-Sample. Recovered 1.0/2.0'=50%. GRAVEL: dusky brown (5YR 2/2) granite and quartzite coarse sand, pebbles and cobbles; some fine-grained sand; silty; slightly calcareous; poorly sorted; subangular; unconsolidated; dry. | | | | | |
| | 5 | | | 2.0-4.0'-Sample. Recovered 0.9/2.0'=45%. GRAVEL: Same as above; calcareous; horizontal bedding; poorly sorted; unconsolidated; dry. | | | | | |
| | | | | 4.0-7.0'-Sample. Recovered 3.0/3.0'=100%. GRAVEL: very pale orange (10YR 6/2) to grayish orange (10YR 7/4) pebbles; grades downward into yellowish orange (10YR 6/6) coarse-grained sand; trace silt and clay; noncalcareous; poorly sorted; subangular; damp. | | | | | |
| | 10 | | | 7.0-8.0'-Sample. Recovered 0.0/1.0'=0%. | | | | | |
| | | | | 8.0-12.0'-Sample. Recovered 4.0/4.0'=100%. | | | | | |
| | | | | 8.0-9.2'. GRAVEL: very pale orange (10YR 6/2) to grayish orange (10YR 7/4) pebbles with dark yellowish orange (10YR 6/6) coarse-grained sand; gravel layer at bottom; poorly sorted; unconsolidated; wet. | | | | | |
| | 15 | | | ARAPAHOE FORMATION | | | | | |
| | | | | 9.2-12.0'. CLAYSTONE: pale olive (10Y 4/2) to grayish olive (10Y 4/2) with dark yellowish orange (10YR 6/6) mottling; silty; coarse-grained sandstone stringer at 9.8'; firm; weathered; damp. | | | | | |
| | 20 | | | | | | | | |

Remarks Logged by: T. Murphy & J. Bergman

Checked by: *[Signature]*

Project No.

106P06222

Hydro-Search, Inc.

Page 1 of 8

Project: Rocky Flats Plant

LOG OF BORING NO. 27-86

Date Drilled 8/29/86 and 9/12/86 to 9/18/86

Coordinates N 37794.1 E 22134.9

Boring Method Hollow Stem Auger, NC Core

Ground Surface Elevation 5961.86

| Elev. (feet) | Depth (feet) | Sample Type | Graphic Log | Material Description | Penetration Resistance (Blows/Inch) | | Water Content (%) | | Other Tests |
|-----------------|-----------------|----------------|----------------|--|---|----|-------------------------|----|----------------|
| | | | | | 20 | 40 | 20 | 40 | |
| | 20 | | | 12.0-17.0'-Sample. Recovered 5.0/5.0'=100%. CLAYSTONE: light gray (N 7) to medium gray (N 5) with dark yellowish orange (10YR 6/6) mottling. At 15.5' grades into medium dark gray (N 4) claystone; unweathered; damp to wet. | | | | | |
| | | | | 17.0-22.0'-Sample. Recovered 5.0/5.0'=100%. | | | | | |
| | 25 | | | 17.0-19.6'. CLAYSTONE: light gray (N 7) to medium gray (N 5) with dark yellowish orange (10YR 6/6) mottles; firm; damp. | | | | | |
| | | | | 19.6-22.0'. CLAYSTONE: pale olive (10YR 6/2) claystone with slight dark yellowish orange (10YR 6/6) mottling along fractures; some ironstone in fractures; firm; damp. | | | | | |
| | 30 | | | 23.0-28.5'-Sample. Recovered 3.5/5.0'=69%. RQD 2.9/3.5=87%. CLAYSTONE: dark yellowish orange (10YR 6/6); sandy; grades downward into a dusky yellow (5Y 6/4) sandy claystone; several patches of white very fine-grained sand; consolidated; dry. | | | | | |
| | | | | 28.5-33.5'-Sample. Recovered 2.0/5.0'=40%. RQD 1.5/2.0'=75%. CLAYSTONE: light gray (N 7) and pale yellowish brown (10YR 6/2); white caliche at 31.5' (0.25" thick); strong reaction strongly with HCL; consolidated; dry. | | | | | |
| | 35 | | | 33.5-38.5'-Sample. Recovered 2.1/5.0'=42%. RQD 2.1/2.1'=100%. CLAYSTONE: dark yellowish orange (10YR 6/6) with moderate yellowish brown (10YR 5/4) limonite stains; grades downward into a pale yellowish brown (10YR 6/2) slightly sandy claystone; consolidated; dry. | | | | | |
| | 40 | | | | | | | | |

Remarks Logged by: T. Murphy & J. Bergman

Checked by: *[Signature]*

Project No.
106P06222

Hydro-Search, Inc.

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Project: Rocky Flats Plant

LOG OF BORING NO. 27-86

Date Drilled 8/29/86 and 9/12/86 to 9/18/86


Coordinates N 37794.1 E 22134.9

Boring Method Hollow Stem Auger/NC Core

Ground Surface Elevation 5961.86

| Elev. (feet) | Depth (feet) | Sample Type | Graphic Log | Material Description | Penetration Resistance (Blows/Inch) 20 40 | Water Content (%) 20 40 | Other Tests |
|-----------------|-----------------|----------------|----------------|---|--|----------------------------------|----------------|
| | 40 | | | 38.5-43.5'-Sample. Recovered 3.6/5.0'=73%. RQD 3.6/3.6'=100%. CLAYSTONE: light olive gray (5Y 5/2); some fine to very fine-grained sand; dark yellowish orange (10YR 6/6) mottling; black organic fragments; few caliche stringers; consolidated; dry. | | | |
| | 45 | | | 43.5-47.5'-Sample. Recovered 1.6/4.0'=40%. RQD 0.8/1.6'=50%. CLAYSTONE: yellowish brown (10YR 2/2) with some moderate yellowish orange (10YR 6/6) mottling; sandy; few black organic fragments; consolidated; damp. | | | |
| | 50 | | | 47.5-52.5'-Sample. Recovered 5.0/5.0'=100%. RQD 5.0/5.0'=100%. CLAYSTONE: olive gray (5Y 3/2); no mottling; homogenous; consolidated; dry. | | | |
| | 55 | | | 52.5-57.5'-Sample. Recovered 3.5/5.0'=70%. RQD 2.5/3.5'=71%. CLAYSTONE: Same as above; dry. | | | |
| | 60 | | | 57.5-62.5'-Sample. Recovered 5.0/5.0'=100%. RQD 5.0/5.0'=100%. CLAYSTONE: olive gray (5Y 3/2) with moderate yellowish brown (10YR 5/4) mottling; at 59.0' and 59.5' hit a thin layer 0.3' and 0.1' thick, respectively, of moderate yellowish brown (10YR 5/4) siltstone nodules; very fine-grained; dry. | | | |

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106P06222

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Project: Rocky Flats Plant

LOG OF BORING NO. 27-86

Date Drilled 8/29/86 and 9/12/86 to 9/18/86

Coordinates N 37794.1 E 22134.9

Boring Method Hollow Stem Auger/NC Core

Ground Surface Elevation 5961.86

| Elev. (feet) | Depth (feet) | Sample Type | Graphic Log | Material Description | Penetration Resistance (Blows/Inch) | | Water Content (%) | | Other Tests |
|-----------------|-----------------|----------------|----------------|--|---|----|-------------------------|----|----------------|
| | | | | | 20 | 40 | 20 | 40 | |
| | 60 | | | | | | | | |
| | | | | 62.5-67.5'-Sample. Recovered 5.0/5.0'=100%. RQD 5.0/5.0'=100%. CLAYSTONE: olive gray (5Y 3/2); sandy; several moderate yellowish brown (10YR 5/4) siltstone nodules at 66.4', 66.9' and 67.0'; each layer is less than .05' wide; consolidated; moist. | | | | | |
| | 65 | | | | | | | | |
| | | | | 67.5-72.5'-Sample. Recovered 5.0/5.0'=100%. RQD 5.0/5.0'=100%. CLAYSTONE: olive gray (5Y 3/2); sandy; moderate yellowish brown (10YR 5/4) siltstone nodules; consolidated; moist. | | | | | |
| | 70 | | | | | | | | |
| | | | | 72.5-77.5'-Sample. Recovered 4.4/5.0'=88%. RQD 4.4/4.4'=100%. CLAYSTONE: olive gray (5Y 3/2); sandy; layer of moderate yellowish brown (10YR 5/4) siltstone nodules 73.8'; consolidated; moist. | | | | | |
| | 75 | | | | | | | | |
| | | | | 77.5-82.5'-Sample. Recovered 4.5/5.0'=90%. RQD 4.5/4.5'=100%. CLAYSTONE: olive gray (5Y 3/2); sandy; black organic fragments; consolidated; damp. | | | | | |
| | 80 | | | | | | | | |

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Project No.

106P06222

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Project: Rocky Flats Plant

LOG OF BORING NO. 27-86

Date Drilled 8/29/86 and 9/12/86 to 9/18/86

Coordinates N 37794.1 E 22134.9

Boring Method Hollow Stem Auger/NC Core

Ground Surface Elevation 5961.86

| Elev. (feet) | Depth (feet) | Sample Type | Graphic Log | Material Description | Penetration Resistance (Blows/Inch) | | Water Content (%) | | Other Tests |
|-----------------|-----------------|----------------|----------------|--|---|----|-------------------------|----|----------------|
| | | | | | 20 | 40 | 20 | 40 | |
| | 80 | | | | | | | | |
| | | | | 82.5-87.5'-Sample. Recovered 5.0/5.5'=91%. RQD 5.0/5.0'=100%. CLAYSTONE: Same as above; damp. | | | | | |
| | 85 | | | 87.5-92.5'-Sample. Recovered 5.0/5.0'=100%. RQD 5.0/5.0'=100%. CLAYSTONE: olive gray (5Y 3/2); moderate yellowish brown (10YR 5/4) siltstone nodules 91.8'; black organic fragments; consolidated; damp. | | | | | |
| | 90 | | | | | | | | |
| | | | | 92.5-97.5'-Sample. Recovered 3.2/5.0'=64%. RQD 3.0/3.2'=94%. CLAYSTONE: olive gray (5Y 3/2); black organic fragments; consolidated; dry. | | | | | |
| | 95 | | | | | | | | |
| | | | | 97.5-102.5'-Sample. Recovered 5.0/5.0'=100%. RQD 2.5/5.0'=50%. SILTSTONE: olive gray (5Y 3/2); very fine-grained; slightly sandy; black organic fragments; laminated; homogeneous; consolidated; dry. | | | | | |
| | 100 | | | | | | | | |

Remarks Logged by: T. Murphy & J. Bergman

Checked by: *[Signature]*

Project No.
106P06222

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Project: Rocky Flats Plant

LOG OF BORING NO. 27-86

Date Drilled 8/29/86 and 9/12/86 to 9/18/86

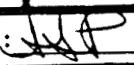
Coordinates N 37794.1 E 22134.9

Boring Method Hollow Stem Auger/NC Core

Ground Surface Elevation 5961.86

| Elev. (feet) | Depth (feet) | Sample Type | Graphic Log | Material Description | Penetration Resistance (Blows/Inch) | | Water Content (%) | | Other Tests |
|-----------------|-----------------|----------------|----------------|--|---|----|-------------------------|----|----------------|
| | | | | | 20 | 40 | 20 | 40 | |
| | 100 | | | | | | | | |
| | | | | 102.5-107.5-Sample. Recovered 3.8/5.0'=76%. RQD 3.0/3.8=79%. SILTSTONE: Same as above; dry. | | | | | |
| | 105 | | | 107.5-110.5'-Sample. Recovered 3.0/3.0'=100%. RQD 3.0/3.0'=100%. SILTSTONE: Same as above; dry. | | | | | |
| | | | | | | | | | |
| | 110 | | | 110.5-113.5'-Sample. Recovered 0.25/3.0'=8%. RQD 0.0/0.25'=0%. SILTSTONE: Same as above; dry. | | | | | |
| | | | | 113.0-117.0'-Sample. Recovered 2.2/4.0'=55%. RQD 0.1/2.2'=5%. CLAYSTONE: Olive gray (5Y 3/2); silty; some very fine-grained sand; black organic fragments; homogenous; consolidated; damp. | | | | | |
| | 115 | | | 117.0-122.0'-Sample. Recovered 3.5/5.0'=70%. RQD 2.7/3.5'=77%. CLAYSTONE: olive gray (5Y 3/2); silty; few organics; homogenous; damp. | | | | | |
| | | | | | | | | | |
| | 120 | | | | | | | | |

Remarks Logged by: T. Murphy & J. Bergman

Checked by: 

Project No.

106P06222

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Project: Rocky Flats Plant

LOG OF BORING NO. 27-86

Date Drilled 8/29/86 and 9/12/86 to 9/18/86


Coordinates N 37794.1 E 22134.9

Boring Method Hollow Stem Auger/NC Core

Ground Surface Elevation 5961.86

| Elev. (feet) | Depth (feet) | Sample Type | Graphic Log | Material Description | Penetration Resistance (Blows/Inch) 20 40 | Water Content (%) 20 40 | Other Tests |
|-----------------|-----------------|----------------|----------------|--|--|----------------------------------|----------------|
| | 120 | | | 122.0-127.0'-Sample. Recovered 5.0/5.0'=100%. RQD 5.0/5.0'=100%. CLAYSTONE: olive gray (5Y 3/2); silty; some very fine-grained sand; few organic fragments; homogenous; hard; dry. | | | |
| | | | | 127.0-132.0'-Sample. Recovered 5.0/5.0'=100%. RQD 5.0/5.0'= 100%. | | | |
| | 125 | | | 127.0-129.0'. CLAYSTONE: olive gray (5Y 3/2); sandy; black organic fragments; homogeneous; consolidated; dry. | | | |
| | | | | 129.0-132.0'. SANDSTONE: clay grades into light gray (N 7) sandstone; silty; very fine-grained; thin clay laminae; few organics; well sorted; rounded; consolidated; dry. | | | |
| | 130 | | | 132.0-137.0'-Sample. Recovered 3.5/5.0'=70%. RQD 2.3/3.5=66%. 132.0-133.9'. SANDSTONE: light gray (N 7); silty; very fine-grained; very thin clay laminae; well sorted; rounded; consolidated; dry. | | | |
| | | | | 133.9-137.0. CLAYSTONE: grades into olive gray (5Y 3/2) claystone; silty and sandy; laminations in sandy intervals; no organics; consolidated; dry. | | | |
| | 135 | | | 137.0-142.0'-Sample. Recovered 3.2/5.0'=64%. RQD 2.2/3.2'=69%. CLAYSTONE: olive gray (5Y 3/2); light brown (5YR 6/4) mottling; no organics; homogenous; slightly damp. | | | |
| | 140 | | | | | | |

Remarks Logged by: T. Murphy & J. Bergman

Checked by: Project No.
106P06222

Hydro-Search, Inc.

Page 7 of 8

Project: Rocky Flats Plant

LOG OF BORING NO. 27-86

Date Drilled 8/29/86 and 9/12/86 to 9/18/86

Coordinates N 37794.1 E 22134.9

Boring Method Hollow Stem Auger/NC Core

Ground Surface Elevation 5961.86

| Elev. (feet) | Depth (feet) | Sample Type | Graphic Log | Material Description | Penetration Resistance (Blows/Inch) | | Water Content (%) | | Other Tests |
|-----------------|-----------------|----------------|----------------|---|---|----|-------------------------|----|----------------|
| | | | | | 20 | 40 | 20 | 40 | |
| | 140 | | | 142.0-147.0'-Sample. Recovered 5.0/5.0'=100%. RQD 3.8/5.0'=76%. CLAYSTONE: olive gray (5Y 3/2); silty; some very fine-grained sand; grades downward into very fine-grained gray (N 7) sandstone; silty; few organics; laminated; well sorted; rounded; consolidated; dry. | | | | | |
| | 145 | | | 147.0-152.0'-Sample. Recovered 5.0/5.0'=100%. RQD 5.0/5.0'=100%. CLAYSTONE: olive gray (5Y 3/2) silty claystone and pale olive (10Y 6/2) very fine-grained silty sandstone; sandstone layers are less than 0.1' thick; well sorted; few organics; 2 dusky yellow (5Y 6/4) siltstone pockets at 148.0'; sample exhibits increased clay content with depth; consolidated; hard; slightly damp. | | | | | |
| | 150 | | | 152.0-157.0'-Sample. Recovered 3.1/5.0'=62%. RQD 0.8/3.1'=26%. CLAYSTONE: alternating bands of olive gray (5Y 3/2) claystone and very fine-grained gray (N 7) silty sandstone; grades downward into olive gray (5Y 3/2) silty claystone; pale yellowish brown (10YR 6/2) siltstone nodule at 155.0'; consolidated; slightly damp. | | | | | |
| | 155 | | | TOTAL DEPTH: 157.0' | | | | | |
| | 160 | | | | | | | | |

Remarks Logged by: T. Murphy & J. Bergman

Checked by: *[Signature]*Project No.
106P06222

Hydro-Search, Inc.

Page 8 of 8

WELL CONSTRUCTION SUMMARY

 LOCATION or COORDS: _____
 N 37794.1 E 22134.9

 ELEVATION: GROUND LEVEL 5961.86'
 TOP OF CASING 5963.26'

DRILLING SUMMARY:

 TOTAL DEPTH Well: 133.00' Hole: 157.00'
 BOREHOLE DIAMETER 0.00' - 22.00': 7½"
 22.00' - 157.00': 5 5/8"

 DRILLER Boyles Brothers Drilling Co.
 15865 W. 5th Avenue, Golden, CO
 (Dave Jarvie, Robert Roach)

 RIG 0.00' - 22.00': Mobile B-57; 22.00' -
 157.00': Falling

 BIT(S) 0.00' - 22.00': T5; 22.00' - 157.00':
 coring bit; stone bit, tricone

 DRILLING FLUID 0.00' - 22.00': none; 22.00' -
 157.00': air/water mist

 SURFACE CASING 5" x 22.6' steel w/ locking
 cap

WELL DESIGN:

 BASIS: GEOLOGIC LOG X GEOPHYSICAL LOG _____

CASING STRING(S): C=CASING S=SCREEN

| | | | | |
|---------|---------|----|--|--|
| 0.00' | 21.00' | C1 | | |
| 0.00' | 128.50' | C2 | | |
| 128.50' | 133.00' | S1 | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

 CASING: C1 5" I.D. steel surface casing
 C2 2" I.D. Sch. 5 type 316 stain-
 less steel, threaded and flush
 jointed.

 SCREEN: S1 2" I.D. Sch. 5 type 316 stain-
 less steel, threaded and flush
 jointed, 0.010" wire wrap screen,
 0.25' welded bottom cap.

CENTRALIZERS None

 FILTER MATERIAL 32-42 silica sand
 127.50' - 135.70'

 CEMENT Portland Type I
 0.00' - 126.50'

 OTHER 3/8" bentonite pellets
 126.50' - 127.00'
 135.75' - 157.00'

CONSTRUCTION TIME LOG:

| TASK | START | | FINISH | |
|--------------------|-------|------|--------|------|
| | DATE | TIME | DATE | TIME |
| DRILLING: | 1986 | | 1986 | |
| 7½" auger | 8/29 | 0935 | 8/29 | 1200 |
| NC core | 9/11 | 1545 | 9/17 | 1615 |
| Reaming | 9/19 | 0905 | 9/19 | 0945 |
| GEOPHYS. LOGGING: | — | — | — | — |
| CASING: | | | | |
| 5" steel | 8/29 | 1300 | 8/29 | 1330 |
| 2" stainless | 9/22 | 1110 | 9/22 | 1135 |
| FILTER PLACEMENT: | 9/22 | 1140 | 9/22 | 1150 |
| CEMENTING: | 9/23 | 1820 | 9/24 | 0920 |
| LEVELCMENT: | 9/30 | 1215 | 10/1 | 0912 |
| OTHER: | | | | |
| Bentonite | 9/22 | 1520 | 9/22 | 1620 |
| | 9/19 | 1625 | 9/19 | 1700 |
| Packer testing | | | | |
| Cementing 5" steel | 8/29 | 1330 | 8/29 | 1400 |

WELL DEVELOPMENT

See Well Development Summary Sheet.

COMMENTS:

Water encountered at 8.0' during drilling.

Top of stainless steel casing: 140'

CLIENT/SUBJECT _____ W.O. NO. _____

TASK DESCRIPTION _____ TASK NO. _____

| | | | |
|----------------------|------------|------------|---|
| PREPARED BY _____ | DEPT _____ | DATE _____ | APPROVED BY _____ DEPT _____ DATE _____ |
| MATH CHECK BY _____ | DEPT _____ | DATE _____ | |
| METHOD REV. BY _____ | DEPT _____ | DATE _____ | |

WELL 27-86

Hydraulic Conductivity (cm/sec) = 1.9×10^{-7}

Flowrate (gpm) = 0.0833 gpm

Screened Interval (ft below G.L.) = 128.5 - 133.0'

128.5 - 129.0 claystone

129.0 - 133.0 sandstone

Method of Analysis: Residual-drawdown Plot

(Driscoll, 1926 - pg 256.)

CLIENT/SUBJECT _____ W.O. NO. _____

TASK DESCRIPTION _____ TASK NO. _____

| | | | |
|----------------------|------------|------------|-----------------------|
| PREPARED BY _____ | DEPT _____ | DATE _____ | APPROVED BY _____ |
| MATH CHECK BY _____ | DEPT _____ | DATE _____ | |
| METHOD REV. BY _____ | DEPT _____ | DATE _____ | DEPT _____ DATE _____ |

WELL 27-86

$$T \text{ (gpd/ft)} = \frac{264 Q}{\Delta S'} = \frac{(264)(0.0833)}{1216} = 1.81 \times 10^{-2}$$

where $Q \text{ (gpm)} = 1.5 \text{ gal} / 18 \text{ min} = 0.0833 \text{ gpm}$

$\Delta S' = \Delta t$, change in residual drawdown / log cycle
 $= 1,216 \text{ ft}$ (see attached plot)

$$K \text{ (gpd/ft}^2\text{)} = T/b = 1.81 \times 10^{-2} / 4.5 = 4.02 \times 10^{-3}$$

where $b \text{ (ft)} = 4.50 \text{ ft}$

$$K \text{ (cm/sec)} = 4.02 \times 10^{-3} \text{ gpd/ft}^2 \times \frac{4.72 \times 10^{-5} \text{ cm/sec}}{\text{gpd/ft}^2} = 1.9 \times 10^{-7}$$

This method is valid where $u \leq 0.01$

solving for t for $u \leq 0.01$

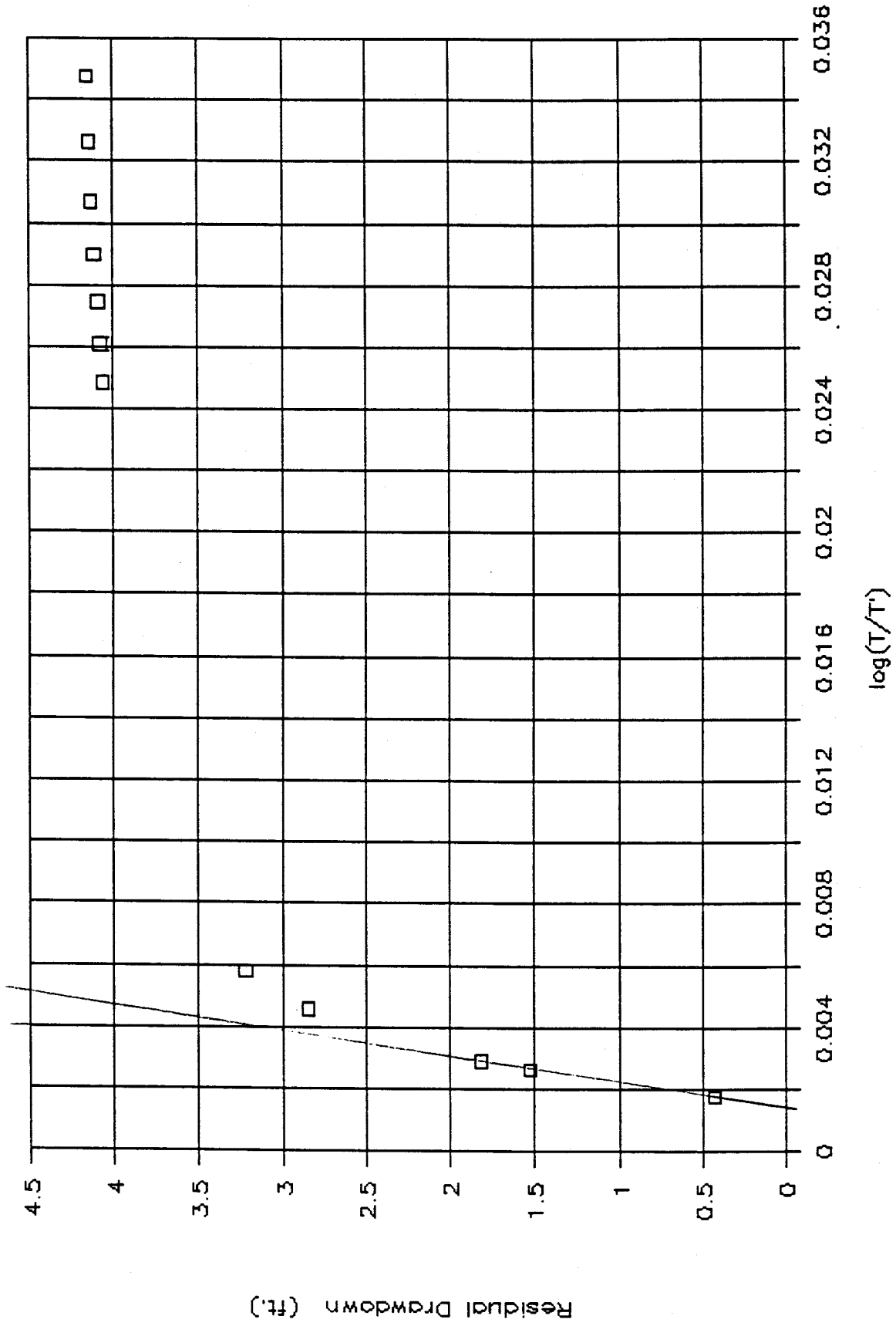
$$t \text{ (min)} = \frac{r^2 S}{4 T u} = \frac{(0.234)^2 (10^{-3})}{4 (1.81 \times 10^{-2}) (0.01)} \times \frac{1440 \text{ min}}{\text{day}} \times \frac{7.482 \text{ gal}}{\text{ft}^3}$$

$$= 815 \text{ min.}$$

where $r \text{ (ft)} = \left(\frac{5 \frac{5}{8}}{24} \right) \text{ ft} = 0.234 \text{ ft}$

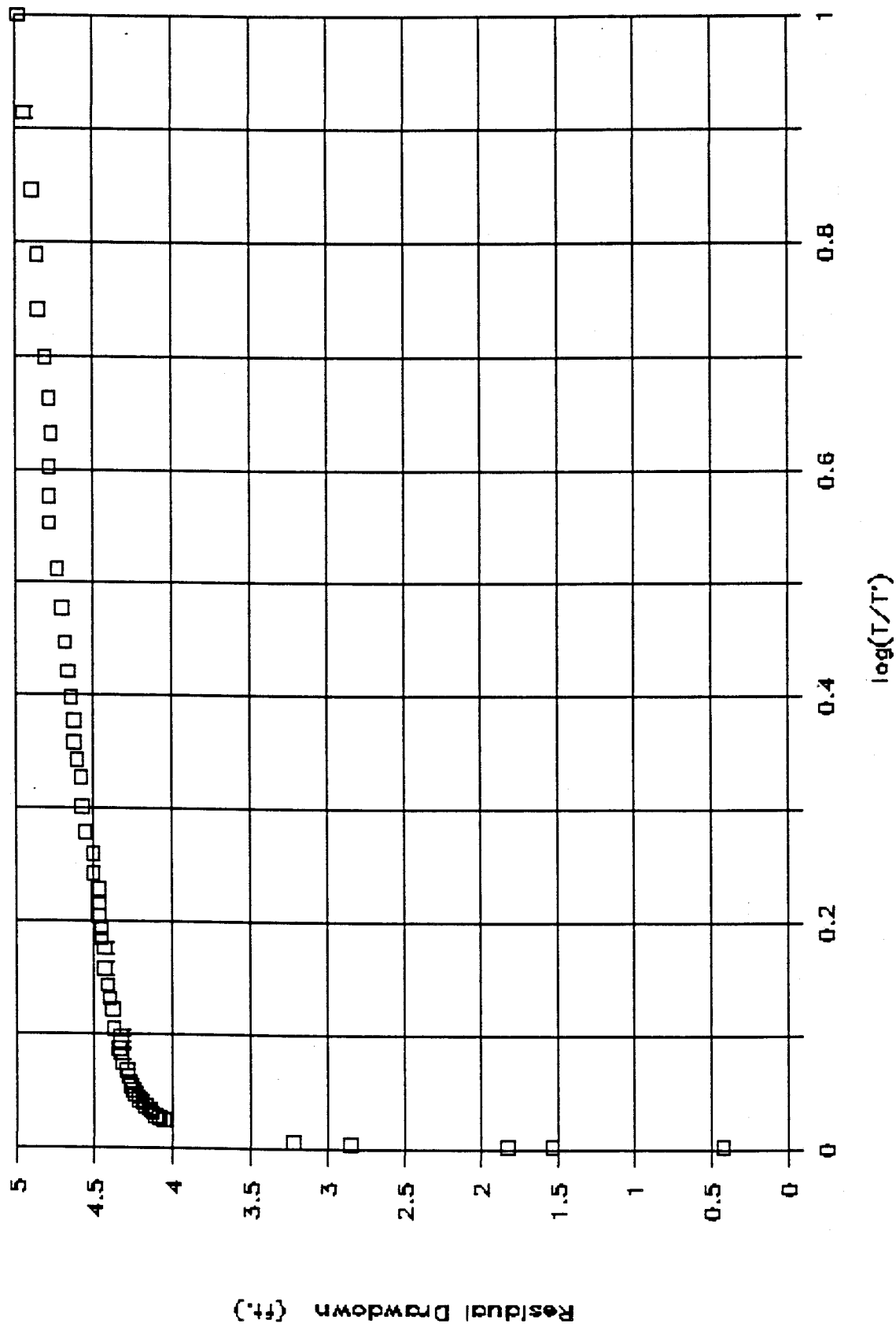
$S = 10^{-3}$ assumed S for confined aquifer
 $\Delta S'$ is based on points where $t \geq 2721 \text{ min}$

WELL 27-86

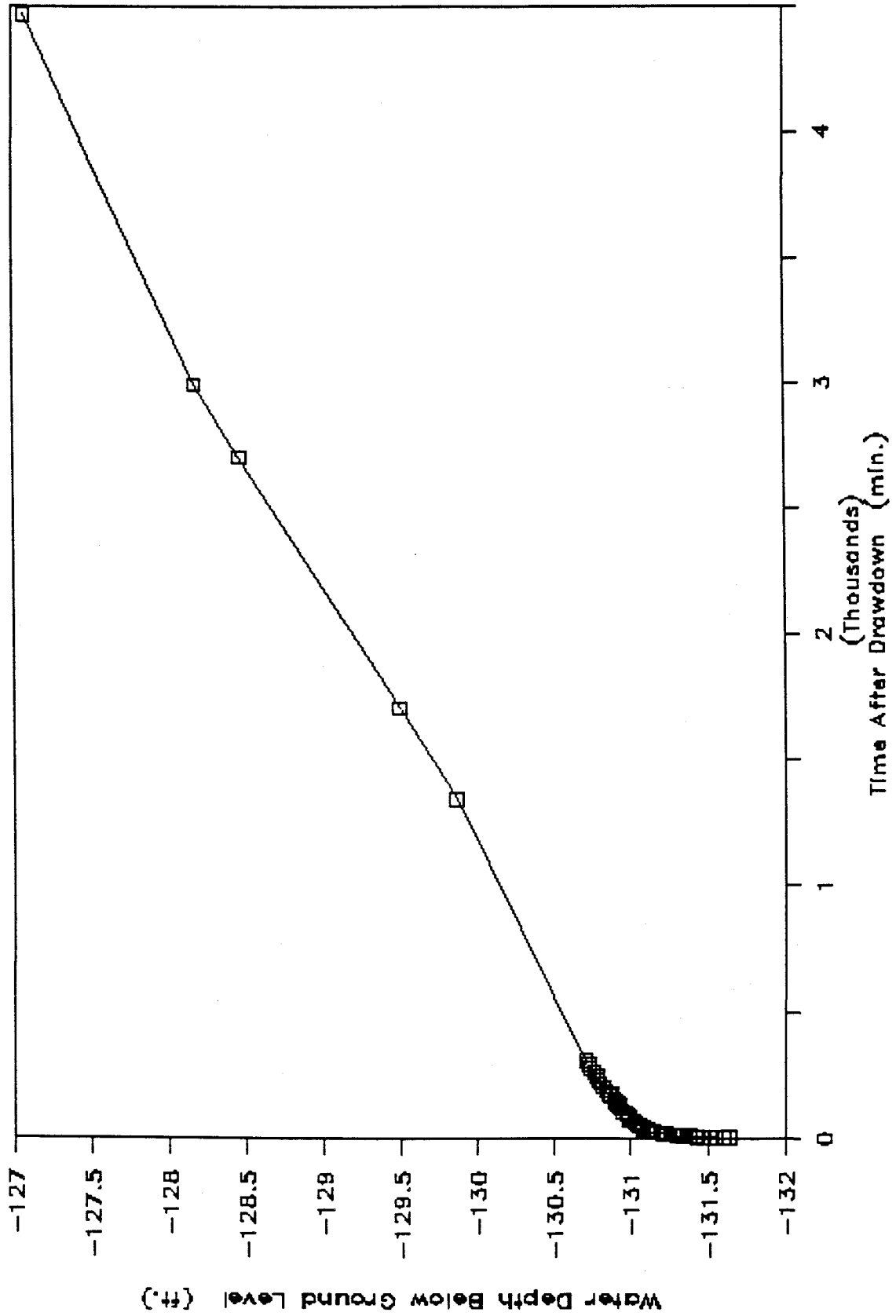


$$\Delta S' = \frac{(4.5 - 0) \text{ ft}}{0.0051 - 0.014} = 1216 \text{ ft} / \log \text{ cycle}$$

WELL 27-86



WELL 27-86



| WELL 27-86 | | | | |
|------------|--------|-------------------------|------------------------|-----------|
| T | T' | Water Level (ft.) | s Rsd Drwn (ft.) | log(T/T') |
| 20.00 | 2.00 | 131.63 | 4.98 | 1.00 |
| 20.50 | 2.50 | 131.59 | 4.94 | 0.91 |
| 21.00 | 3.00 | 131.54 | 4.89 | 0.85 |
| 21.50 | 3.50 | 131.51 | 4.86 | 0.79 |
| 22.00 | 4.00 | 131.50 | 4.85 | 0.74 |
| 22.50 | 4.50 | 131.46 | 4.81 | 0.70 |
| 23.00 | 5.00 | 131.43 | 4.78 | 0.66 |
| 23.50 | 5.50 | 131.42 | 4.77 | 0.63 |
| 24.00 | 6.00 | 131.43 | 4.78 | 0.60 |
| 24.50 | 6.50 | 131.43 | 4.78 | 0.58 |
| 25.00 | 7.00 | 131.43 | 4.78 | 0.55 |
| 26.00 | 8.00 | 131.38 | 4.73 | 0.51 |
| 27.00 | 9.00 | 131.35 | 4.70 | 0.48 |
| 28.00 | 10.00 | 131.33 | 4.68 | 0.45 |
| 29.00 | 11.00 | 131.31 | 4.66 | 0.42 |
| 30.00 | 12.00 | 131.29 | 4.64 | 0.40 |
| 31.00 | 13.00 | 131.27 | 4.62 | 0.38 |
| 32.00 | 14.00 | 131.27 | 4.62 | 0.36 |
| 33.00 | 15.00 | 131.25 | 4.60 | 0.34 |
| 34.00 | 16.00 | 131.23 | 4.58 | 0.33 |
| 36.00 | 18.00 | 131.22 | 4.57 | 0.30 |
| 38.00 | 20.00 | 131.20 | 4.55 | 0.28 |
| 40.00 | 22.00 | 131.15 | 4.50 | 0.26 |
| 42.00 | 24.00 | 131.15 | 4.50 | 0.24 |
| 44.00 | 26.00 | 131.12 | 4.47 | 0.23 |
| 46.00 | 28.00 | 131.12 | 4.47 | 0.22 |
| 48.00 | 30.00 | 131.12 | 4.47 | 0.20 |
| 50.00 | 32.00 | 131.10 | 4.45 | 0.19 |
| 52.00 | 34.00 | 131.10 | 4.45 | 0.18 |
| 54.00 | 36.00 | 131.08 | 4.43 | 0.18 |
| 59.00 | 41.00 | 131.08 | 4.43 | 0.16 |
| 64.00 | 46.00 | 131.06 | 4.41 | 0.14 |
| 69.00 | 51.00 | 131.05 | 4.40 | 0.13 |
| 74.00 | 56.00 | 131.03 | 4.38 | 0.12 |
| 84.00 | 66.00 | 131.02 | 4.37 | 0.10 |
| 89.00 | 71.00 | 130.98 | 4.33 | 0.10 |
| 94.00 | 76.00 | 130.98 | 4.33 | 0.09 |
| 99.00 | 81.00 | 130.99 | 4.34 | 0.09 |
| 104.00 | 86.00 | 130.98 | 4.33 | 0.08 |
| 114.00 | 96.00 | 130.97 | 4.32 | 0.07 |
| 124.00 | 106.00 | 130.94 | 4.29 | 0.07 |
| 134.00 | 116.00 | 130.93 | 4.28 | 0.06 |

| WELL 27-86 | | | | | log(T/T') | |
|------------|---------|--------|----------|--|-----------|--|
| T | T' | Water | s | | | |
| | | Level | Rsd Drwn | | | |
| | | (ft.) | (ft.) | | | |
| 144.00 | 126.00 | 130.92 | 4.27 | | 0.06 | |
| 154.00 | 136.00 | 130.91 | 4.26 | | 0.05 | |
| 164.00 | 146.00 | 130.90 | 4.25 | | 0.05 | |
| 174.00 | 156.00 | 130.89 | 4.24 | | 0.05 | |
| 184.00 | 166.00 | 130.87 | 4.22 | | 0.04 | |
| 194.00 | 176.00 | 130.86 | 4.21 | | 0.04 | |
| 204.00 | 186.00 | 130.84 | 4.19 | | 0.04 | |
| 219.00 | 201.00 | 130.82 | 4.17 | | 0.04 | |
| 234.00 | 216.00 | 130.80 | 4.15 | | 0.03 | |
| 249.00 | 231.00 | 130.79 | 4.14 | | 0.03 | |
| 264.00 | 246.00 | 130.78 | 4.13 | | 0.03 | |
| 279.00 | 261.00 | 130.76 | 4.11 | | 0.03 | |
| 294.00 | 276.00 | 130.74 | 4.09 | | 0.03 | |
| 309.00 | 291.00 | 130.73 | 4.08 | | 0.03 | |
| 324.00 | 306.00 | 130.71 | 4.06 | | 0.02 | |
| 1360.00 | 1342.00 | 129.87 | 3.22 | | 0.01 | |
| 1720.00 | 1702.00 | 129.50 | 2.85 | | 0.00 | |
| 2721.00 | 2703.00 | 128.47 | 1.82 | | 0.00 | |
| 3011.00 | 2993.00 | 128.18 | 1.53 | | 0.00 | |
| 4483.00 | 4465.00 | 127.08 | 0.43 | | 0.00 | |

AQUIFER TEST DATA

WELL 27-86
 PUMPING or OBSERVATION WELL
 PUMPING or RECOVERY DATA
 PAGE 1 OF 2

TYPE OF AQUIFER TEST ED 1
 HOW Q MEASURED 4 gal. bucket
 HOW W.L.'s MEASURED alginate
 RAD./DIST. OF/FROM PUMPING WELL 1"
 MEAS. POINT FOR W.L.'s _____
 ELEVATION OF MEAS. POINT _____

DEPTH OF PUMP/AIRPIPE _____
 PUMP ON: date 11-11-86 time _____
 PUMP OFF: date 11-11-86 time _____
 DURATION OF AQUIFER TEST _____

| TIME | | | | | WATER LEVEL DATA | | | | DISCHARGE | | RECORDED BY | COMMENTS | |
|---------------------|------------|-----|----|----|---|----------------------------|-------------|---------|-----------|-----------|-------------|----------|-----------------------|
| t = _____ at t' = 0 | | | | | STATIC WATER LEVEL <u>126.65 (NAT.)</u> | | | | | | | | |
| DAY | CLOCK TIME | t | t' | 12 | READING | CONVERSIONS OF CORRECTIONS | WATER LEVEL | s or s' | | READING | Q | | |
| 1 | 11:30 | 0.0 | | | 130+3.23 | -1.30 | 131.63 | 4.38 | | | | CW | 11:10 - 11:30 12.1 |
| 1 | 11:30 1/2 | .5 | | | 130+3.19 | -1.30 | 131.59 | 4.34 | | | | CW | |
| | 11:31 | 1.0 | | | 130+3.14 | | 131.54 | 4.39 | | | | " | 11:28 stop |
| | 11:31 1/2 | 1.5 | | | 130+3.11 | | 131.51 | 4.36 | | | | " | 11:28 stop |
| | 11:32 | 2.0 | | | 130+3.10 | | 131.50 | 4.35 | | | | | 11:28 stop |
| | 11:32 1/2 | 2.5 | | | 130+3.06 | | 131.46 | 4.31 | | | | | |
| | 11:33 | 3.0 | | | 130+3.03 | | 131.43 | 4.28 | | | | | |
| | 11:33 1/2 | 3.5 | | | 130+3.02 | | 131.42 | 4.27 | | (READING) | | | 50% recovery = 128.74 |
| | 11:34 | 4.0 | | | 130+3.03 | | 131.43 | 4.28 | | | | | |
| | 11:34 1/2 | 4.5 | | | 130+3.03 | | 131.43 | 4.28 | | | | | |
| 12 | 12:5 | 5.0 | | | 130+3.03 | | 131.43 | 4.28 | | | | | |
| | 12:6 | 6 | | | 130+2.99 | | 131.39 | 4.23 | | | | | |
| | 12:7 | 7 | | | 130+2.95 | | 131.35 | 4.20 | | | | | |
| | 12:8 | 8 | | | 130+2.93 | | 131.33 | 4.18 | | | | | |
| | 12:9 | 9 | | | 130+2.91 | | 131.31 | 4.16 | | | | | |
| | 12:10 | 10 | | | 130+2.87 | | 131.29 | 4.14 | | | | | |
| | 12:11 | 11 | | | 130+2.83 | | 131.27 | 4.12 | | | | | |
| | 12:12 | 12 | | | 130+2.87 | | 131.27 | 4.12 | | | | | |
| | 12:13 | 13 | | | 130+2.65 | | 131.25 | 4.10 | | | | | |
| | 12:14 | 14 | | | 130+2.53 | | 131.23 | 4.08 | | | | | |
| | 12:16 | 16 | | | 130+2.82 | | 131.22 | 4.07 | | | | | |
| | 12:18 | 18 | | | 130+2.30 | | 131.20 | 4.05 | | | | | |
| | 12:20 | 20 | | | 130+2.73 | | 131.15 | 4.00 | | | | | |
| | 12:22 | 22 | | | 130+2.73 | | 131.15 | 4.00 | | | | | |
| | 12:24 | 24 | | | 130+2.72 | | 131.12 | 3.97 | | | | | |
| | 12:26 | 26 | | | 130+2.72 | | 131.12 | 3.97 | | | | | |
| | 12:28 | 28 | | | 130+2.72 | | 131.12 | 3.97 | | | | | |
| | 12:30 | 30 | | | 130+2.70 | | 131.10 | 3.95 | | | | | |
| | 12:32 | 32 | | | 130+2.70 | | 131.10 | 3.95 | | | | | |
| | 12:34 | 34 | | | 130+2.70 | | 131.08 | 3.93 | | | | | |
| | 12:36 | 36 | | | 130+2.68 | | 131.06 | 3.91 | | | | | |
| | 12:38 | 38 | | | 130+2.68 | | 131.06 | 3.91 | | | | | |
| | 12:40 | 40 | | | 130+2.66 | | 131.05 | 3.90 | | | | | |
| | 12:42 | 42 | | | 130+2.63 | | 131.03 | 3.88 | | | | | |
| | 12:44 | 44 | | | 130+2.63 | | 131.03 | 3.88 | | | | | |
| | 12:46 | 46 | | | 130+2.62 | | 131.02 | 3.87 | | | | | |
| | 12:48 | 48 | | | 130+2.58 | | 130.98 | 3.83 | | | | | |
| | 12:49 | 49 | | | 130+2.58 | | 130.98 | 3.83 | | | | | |
| | 12:50 | 50 | | | 130+2.57 | | 130.97 | 3.82 | | | | | |
| | 12:54 | 54 | | | 130+2.57 | | 130.97 | 3.82 | | | | | |
| | 12:56 | 56 | | | 130+2.57 | | 130.97 | 3.82 | | | | | |
| | 12:58 | 58 | | | 130+2.57 | | 130.97 | 3.82 | | | | | |
| | 13:00 | 60 | | | 130+2.57 | | 130.97 | 3.82 | | | | | |

AQUIFER TEST DATA

WELL 27-86
PUMPING or OBSERVATION WELL
PUMPING or RECOVERY DATA
PAGE 2 OF 2

TYPE OF AQUIFER TEST _____
HOW Q MEASURED _____
HOW W.L.'s MEASURED _____
RAD./DIST. OF/FROM PUMPING WELL _____
MEAS. POINT FOR W.L.'s _____
ELEVATION OF MEAS. POINT _____

DEPTH OF PUMP/AIRPIPE _____
PUMP ON: date 11-11-56 time _____
PUMP OFF: date 11-11-56 time _____
DURATION OF AQUIFER TEST _____

[illegible]

15

PACKER TEST ANALYSIS
WELL NO. 27-86
ROCKY FLATS PLANT JOB NO. 106PO6222
DATE TESTED: 9/15/86 BY: J. BERGMAN
TEST INTERVAL (FEET BELOW G.S.): 24.29 - 35.84
MATERIAL TESTED: ARAPAHOE CLAYSTONE
DEPTH TO WATER (FEET BELOW G.S.): 129.14

$$K = \frac{Q}{2(\pi)(L)(H)} \ln\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00264001 (FEET³/MIN)
L = LENGTH OF TEST INTERVAL = 11.55 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 30.07 + 5.00 + 2.00 * 2.31 = 39.69
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000394 FT/MIN
K = .00000200 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00196308 (FEET³/MIN)
L = LENGTH OF TEST INTERVAL = 11.55 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 30.07 + 5.00 + 3.50 * 2.31 = 43.15
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000270 FT/MIN
K = .00000137 CM/SEC

2ND P1/3 TEST

TEST ABORTED

PACKER TEST ANALYSIS

WELL NO. 27-86

ROCKY FLATS PLANT JOB NO. 106P06222

DATE TESTED: 9/15/86 BY: J.BERGMAN

TEST INTERVAL (FEET BELOW G.S.): 24.65 - 35.84

MATERIAL TESTED: ARAPAHOE CLAYSTONE

DEPTH TO WATER (FEET BELOW G.S.): 129.14

$$K = \frac{Q}{2(\pi)(L)(H)} \ln\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00264001 (FEET³/MIN)

L = LENGTH OF TEST INTERVAL = 11.19 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)

= 30.24 + 5.00 + 2.00 * 2.31 = 39.86

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000402 FT/MIN

K = .00000204 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00196308 (FEET³/MIN)

L = LENGTH OF TEST INTERVAL = 11.19 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)

= 30.24 + 5.00 + 3.50 * 2.31 = 43.33

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000275 FT/MIN

K = .00000140 CM/SEC

2ND P1/3 TEST

TEST ABORTED

PACKER TEST ANALYSIS

WELL NO. 27-86

ROCKY FLATS PLANT JOB NO. 106PO6222

DATE TESTED: 9/15/86 BY: J. BERGMAN

TEST INTERVAL (FEET BELOW G.S.): 35.84 - 47.03

MATERIAL TESTED: ARAPAHOE CLAYSTONE

DEPTH TO WATER (FEET BELOW G.S.): 129.14

$$K = \frac{Q}{2(\pi)(L)(H)} \ln\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00078523 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 11.19 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 41.43 + 5.00 + 2.00 * 2.31 = 51.05

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000093 FT/MIN

K = .00000047 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00124554 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 11.19 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 41.43 + 5.00 + 5.50 * 2.31 = 59.14

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000128 FT/MIN

K = .00000065 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00006769 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 11.19 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 41.43 + 5.00 + 2.00 * 2.31 = 51.05

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000008 FT/MIN

K = .00000004 CM/SEC

PACKER TEST ANALYSIS

WELL NO. 27-86

ROCKY FLATS PLANT JOB NO. 106PO6222

DATE TESTED: 9/15/86 BY: J. BERGMAN

TEST INTERVAL (FEET BELOW G.S.): 42.58 - 53.77

MATERIAL TESTED: ARAPAHOE CLAYSTONE

DEPTH TO WATER (FEET BELOW G.S.): 129.14

$$K = \frac{Q}{2(\pi)(L)(H)} \ln\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00001354 (FEET³/MIN)

L = LENGTH OF TEST INTERVAL = 11.19 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 48.18 + 5.00 + 2.00 * 2.31 = 57.80

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000001 FT/MIN

K = .00000001 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00001354 (FEET³/MIN)

L = LENGTH OF TEST INTERVAL = 11.19 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 48.18 + 5.00 + 8.00 * 2.31 = 71.65

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000001 FT/MIN

K = .00000001 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00000000 (FEET³/MIN)

L = LENGTH OF TEST INTERVAL = 11.19 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 48.18 + 5.00 + .00 * 2.31 = 53.18

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000000 FT/MIN

K = .00000000 CM/SEC

NOTE: NO WATER GAIN OR LOSS IN INJECTION TUBE;

Q=0

PACKER TEST ANALYSIS

WELL NO. 27-86

ROCKY FLAT PLANT JOB NO. 106PO6222

DATE TESTED: 9/15/86 BY: J. BERGMAN

TEST INTERVAL (FEET BELOW G.S.): 70.96 - 82.15

MATERIAL TESTED: ARAPAHOE CLAYSTONE

DEPTH TO WATER (FEET BELOW G.S.): 129.14

$$K = \frac{Q}{2(\pi)(L)(H)} \ln\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00287016 (FEET³/MIN)

L = LENGTH OF TEST INTERVAL = 11.19 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)

= 76.56 + 5.00 + 2.50 * 2.31 = 87.33

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000200 FT/MIN

K = .00000101 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .01111511 (FEET³/MIN)

L = LENGTH OF TEST INTERVAL = 11.19 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)

= 76.56 + 5.00 + 14.50 * 2.31 = 115.05

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000587 FT/MIN

K = .00000298 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00476555 (FEET³/MIN)

L = LENGTH OF TEST INTERVAL = 11.19 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)

= 76.56 + 5.00 + 2.00 * 2.31 = 86.18

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000336 FT/MIN

K = .00000171 CM/SEC

PACKER TEST ANALYSIS

WELL NO. 27-86

PLANT JOB NO. 106PO6222

TESTED: 9/15/86 BY: J. BERGMAN

VAL (FEET BELOW G.S.): 70.96 - 82.15

TESTED: ARAPAHOE CLAYSTONE

WATER (FEET BELOW G.S.): 129.14

$$= \frac{Q}{2(\pi)(L)(H)} \ln\left(\frac{L}{R}\right)$$

EST

Q = INJECTION RATE = .00287016 (FEET³/MIN)

L = LENGTH OF TEST INTERVAL = 11.19 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)

= 76.56 + 5.00 + 2.50 * 2.31 = 87.33

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000200 FT/MIN

K = .00000101 CM/SEC

Q = INJECTION RATE = .01111511 (FEET³/MIN)

L = LENGTH OF TEST INTERVAL = 11.19 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)

= 76.56 + 5.00 + 14.50 * 2.31 = 115.05

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000587 FT/MIN

K = .00000298 CM/SEC

EST

Q = INJECTION RATE = .00476555 (FEET³/MIN)

L = LENGTH OF TEST INTERVAL = 11.19 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)

= 76.56 + 5.00 + 2.00 * 2.31 = 86.18

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000336 FT/MIN

K = .00000171 CM/SEC

PACKER TEST ANALYSIS

WELL NO. 27-86

ROCKY FLATS PLANT JOB NO. 106P06222

DATE TESTED: 9/15/86 BY: J. BERGMAN

TEST INTERVAL (FEET BELOW G.S.): 82.15 - 93.34

MATERIAL TESTED: ARAPAHOE CLAYSTONE

DEPTH TO WATER (FEET BELOW G.S.): 129.14

$$K = \frac{Q}{2(PI)(L)(H)} \frac{L}{LN(\frac{L}{R})}$$

1ST P1/3 TEST

Q = INJECTION RATE = .00054154 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 11.19 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 87.74 + 5.00 + 2.00 * 2.31 = 97.36

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000034 FT/MIN

K = .00000017 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .01650343 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 11.19 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 87.74 + 5.00 + 17.30 * 2.31 = 132.71

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .000000755 FT/MIN

K = .000000384 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00119139 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 11.19 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 87.74 + 5.00 + 2.00 * 2.31 = 97.36

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .000000074 FT/MIN

K = .000000038 CM/SEC

PACKER TEST ANALYSIS

WELL NO. 27-86

ROCKY FLATS PLANT JOB NO. 106PO6222

DATE TESTED: 9/15/86 BY: J. BERGMAN

TEST INTERVAL (FEET BELOW G.S.): 96.43 - 107.62

MATERIAL TESTED: ARAPAHOE CLAYSTONE

DEPTH TO WATER (FEET BELOW G.S.): 129.14

$$K = \frac{Q}{2(P_I)(L)(H)} \ln\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00113723 (FEET³/MIN)

L = LENGTH OF TEST INTERVAL = 11.19 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 102.03 + 5.35 + 2.00 * 2.31 = 112.00

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000062 FT/MIN

K = .00000031 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00104246 (FEET³/MIN)

L = LENGTH OF TEST INTERVAL = 11.19 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 102.03 + 5.35 + 20.00 * 2.31 = 153.57

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000041 FT/MIN

K = .00000021 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00013539 (FEET³/MIN)

L = LENGTH OF TEST INTERVAL = 11.19 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 102.03 + 5.35 + 2.00 * 2.31 = 112.00

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000007 FT/MIN

K = .00000004 CM/SEC

PACKER TEST ANALYSIS
WELL NO. 27-86
ROCKY FLATS PLANT JOB NO. 106PO6222
DATE TESTED: 9/15/86 BY: J. BERGMAN
TEST INTERVAL (FEET BELOW G.S.): 96.43 - 107.62
MATERIAL TESTED: ARAPAHOE CLAYSTONE
DEPTH TO WATER (FEET BELOW G.S.): 129.14

$$K = \frac{Q}{2(\pi)(L)(H)} \ln\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00113723 (FEET³/MIN)
L = LENGTH OF TEST INTERVAL = 11.19 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 102.03 + 5.35 + 2.00 * 2.31 = 112.00
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000062 FT/MIN
K = .00000031 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00104246 (FEET³/MIN)
L = LENGTH OF TEST INTERVAL = 11.19 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 102.03 + 5.35 + 20.00 * 2.31 = 153.57
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000041 FT/MIN
K = .00000021 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00013539 (FEET³/MIN)
L = LENGTH OF TEST INTERVAL = 11.19 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 102.03 + 5.35 + 2.00 * 2.31 = 112.00
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000007 FT/MIN
K = .00000004 CM/SEC

PACKER TEST ANALYSIS
 WELL NO. 27-86
 ROCKY FLATS PLANT JOB NO. 106PO6222
 DATE TESTED: 9/15/86 BY: J. BERGMAN
 TEST INTERVAL (FEET BELOW G.S.): 107.62 - 118.81
 MATERIAL TESTED: ARAPAHOE CLAYSTONE
 DEPTH TO WATER (FEET BELOW G.S.): 129.14

$$K = \frac{Q}{2(\pi)(L)(H)} \ln\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00005415 (FEET³/MIN)
 L = LENGTH OF TEST INTERVAL = 11.19 FEET
 TEST INTERVAL IS ABOVE WATER TABLE
 HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
 + GAGE PRESSURE (IN FEET)
 = 113.21 + 5.35 + 2.00 * 2.31 = 123.18
 R = BOREHOLE RADIUS = .16 FEET

 K = HYDRAULIC CONDUCTIVITY = .00000003 FT/MIN
 K = .00000001 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00048739 (FEET³/MIN)
 L = LENGTH OF TEST INTERVAL = 11.19 FEET
 TEST INTERVAL IS ABOVE WATER TABLE
 HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
 + GAGE PRESSURE (IN FEET)
 = 113.21 + 5.35 + 23.00 * 2.31 = 171.69
 R = BOREHOLE RADIUS = .16 FEET

 K = HYDRAULIC CONDUCTIVITY = .00000017 FT/MIN
 K = .00000009 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00002708 (FEET³/MIN)
 L = LENGTH OF TEST INTERVAL = 11.19 FEET
 TEST INTERVAL IS ABOVE WATER TABLE
 HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
 + GAGE PRESSURE (IN FEET)
 = 113.21 + 5.35 + 2.00 * 2.31 = 123.18
 R = BOREHOLE RADIUS = .16 FEET

 K = HYDRAULIC CONDUCTIVITY = .00000001 FT/MIN
 K = .00000001 CM/SEC

PACKER TEST ANALYSIS
 WELL NO. 27-86
 ROCKY FLATS PLANT JOB NO. 106PO6222
 DATE TESTED: 9/15/86 BY: J. BERGMAN
 TEST INTERVAL (FEET BELOW G.S.): 107.62 - 118.81
 MATERIAL TESTED: ARAPAHOE CLAYSTONE
 DEPTH TO WATER (FEET BELOW G.S.): 129.14

$$K = \frac{Q}{2(\pi)(L)(H)} \ln\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00005415 (FEET³/MIN)
 L = LENGTH OF TEST INTERVAL = 11.19 FEET
 TEST INTERVAL IS ABOVE WATER TABLE
 HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
 + GAGE PRESSURE (IN FEET)
 = 113.21 + 5.35 + 2.00 * 2.31 = 123.18
 R = BOREHOLE RADIUS = .16 FEET

 K = HYDRAULIC CONDUCTIVITY = .00000003 FT/MIN
 K = .00000001 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00048739 (FEET³/MIN)
 L = LENGTH OF TEST INTERVAL = 11.19 FEET
 TEST INTERVAL IS ABOVE WATER TABLE
 HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
 + GAGE PRESSURE (IN FEET)
 = 113.21 + 5.35 + 23.00 * 2.31 = 171.69
 R = BOREHOLE RADIUS = .16 FEET

 K = HYDRAULIC CONDUCTIVITY = .00000017 FT/MIN
 K = .00000009 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00002708 (FEET³/MIN)
 L = LENGTH OF TEST INTERVAL = 11.19 FEET
 TEST INTERVAL IS ABOVE WATER TABLE
 HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
 + GAGE PRESSURE (IN FEET)
 = 113.21 + 5.35 + 2.00 * 2.31 = 123.18
 R = BOREHOLE RADIUS = .16 FEET

 K = HYDRAULIC CONDUCTIVITY = .00000001 FT/MIN
 K = .00000001 CM/SEC

PACKER TEST ANALYSIS

WELL NO. 27-86

ROCKY FLATS PLANT JOB NO. 106PO6222

DATE TESTED: 9/15/86 BY: J. BERGMAN

TEST INTERVAL (FEET BELOW G.S.): 118.81 - 130.00

MATERIAL TESTED: ARAPAHOE CLAYSTONE

DEPTH TO WATER (FEET BELOW G.S.): 129.14

$$K = \frac{Q}{2(PI)(L)(H)} \ln\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00005415 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 11.19 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 124.40 + 5.35 + 2.00 * 2.31 = 134.38

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000002 FT/MIN

K = .00000001 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00067693 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 11.19 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 124.40 + 5.35 + 26.00 * 2.31 = 189.82

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000022 FT/MIN

K = .00000011 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00008123 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 11.19 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 124.40 + 5.35 + 2.00 * 2.31 = 134.38

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000004 FT/MIN

K = .00000002 CM/SEC

PACKER TEST ANALYSIS

WELL NO. 27-86

ROCKY FLATS PLANT JOB NO. 106PO6222

DATE TESTED: 9/15/86 BY: J. BERGMAN

TEST INTERVAL (FEET BELOW G.S.): 130.00 - 141.19

MATERIAL TESTED: ARAPAHOE SANDSTONE

DEPTH TO WATER (FEET BELOW G.S.): 129.14

$$K = \frac{Q}{2(PI)(L)(H)} \frac{L}{LN(\frac{L}{R})}$$

1ST P1/3 TEST

Q = INJECTION RATE = .00004062 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 11.19 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 129.14 + 5.35 + 2.00 * 2.31 = 139.11

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000002 FT/MIN

K = .00000001 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00369601 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 11.19 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 129.14 + 5.35 + 27.50 * 2.31 = 198.01

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000113 FT/MIN

K = .00000058 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00035200 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 11.19 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 129.14 + 5.35 + 2.00 * 2.31 = 139.11

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000015 FT/MIN

K = .00000008 CM/SEC

PACKER TEST ANALYSIS
 WELL NO. 27-86
 ROCKY FLATS PLANT JOB NO. 106PO6222
 DATE TESTED: 9/15/86 BY: J. BERGMAN
 TEST INTERVAL (FEET BELOW G.S.): 138.37 - 149.56
 MATERIAL TESTED: ARAPAHOE CLAYSTONE
 DEPTH TO WATER (FEET BELOW G.S.): 129.14

$$K = \frac{Q}{2(\pi)(L)(H)} \ln\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00006769 (FEET³/MIN)
 L = LENGTH OF TEST INTERVAL = 11.19 FEET
 TEST INTERVAL IS BELOW WATER TABLE
 HEAD = DEPTH TO WATER + GAGE HEIGHT
 + GAGE PRESSURE (IN FEET)
 = 129.14 + 5.35 + 3.00 * 2.31 = 141.42
 R = BOREHOLE RADIUS = .16 FEET

 K = HYDRAULIC CONDUCTIVITY = .00000003 FT/MIN
 K = .00000001 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00036554 (FEET³/MIN)
 L = LENGTH OF TEST INTERVAL = 11.19 FEET
 TEST INTERVAL IS BELOW WATER TABLE
 HEAD = DEPTH TO WATER + GAGE HEIGHT
 + GAGE PRESSURE (IN FEET)
 = 129.14 + 5.35 + 30.50 * 2.31 = 204.94
 R = BOREHOLE RADIUS = .16 FEET

 K = HYDRAULIC CONDUCTIVITY = .00000011 FT/MIN
 K = .00000006 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00000000 (FEET³/MIN)
 L = LENGTH OF TEST INTERVAL = 11.19 FEET
 TEST INTERVAL IS BELOW WATER TABLE
 HEAD = DEPTH TO WATER + GAGE HEIGHT
 + GAGE PRESSURE (IN FEET)
 = 129.14 + 5.35 + 3.00 * 2.31 = 141.42
 R = BOREHOLE RADIUS = .16 FEET

 K = HYDRAULIC CONDUCTIVITY = .00000000 FT/MIN
 K = .00000000 CM/SEC

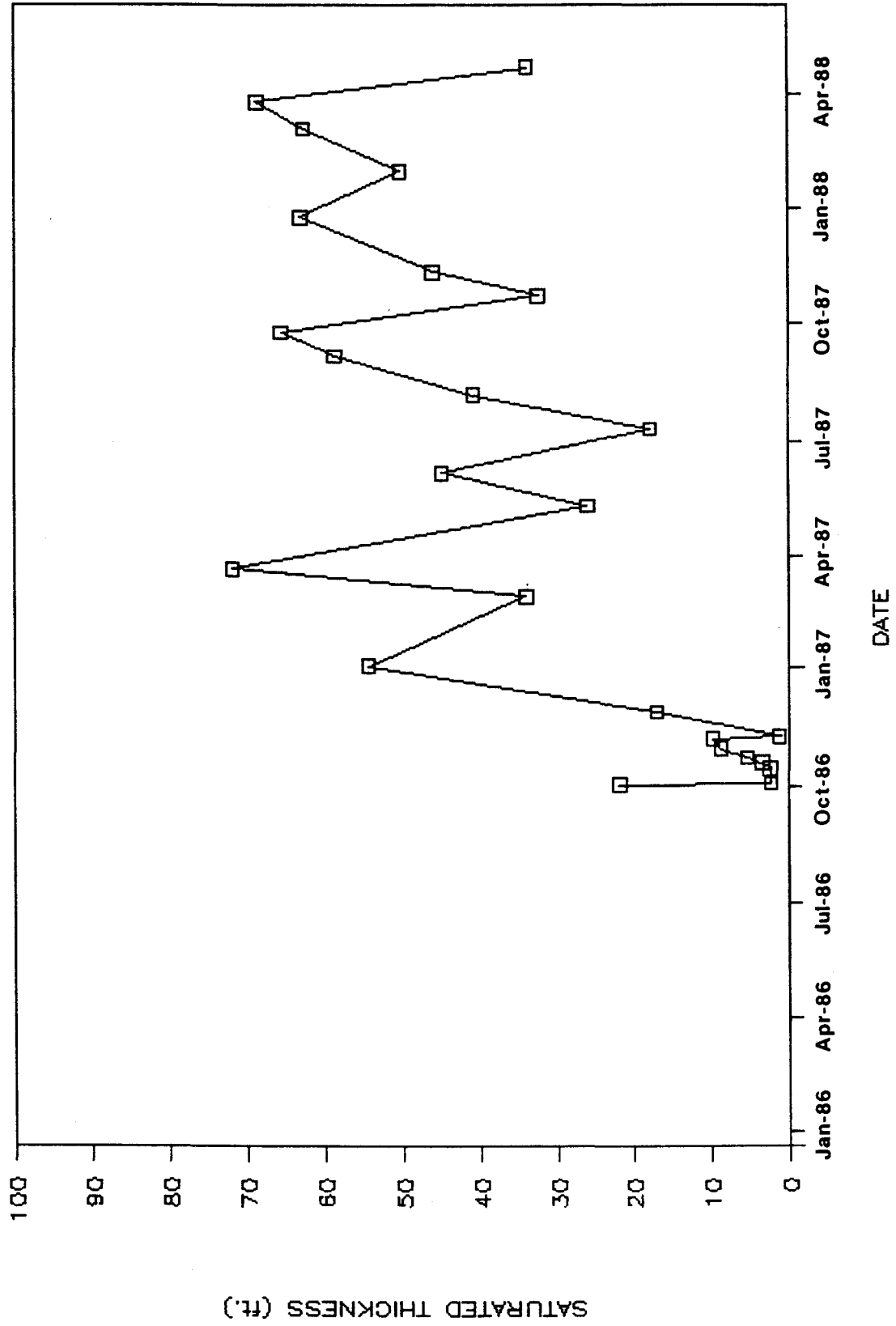
NOTE: NO WATER GAIN OR LOSS IN INJECTION TUBE;
 Q=0

ROCKY FLATS SOLAR PONDS

WATER LEVEL SUMMARY

| WELL NUMBER | DATE | GROUND SURFACE ELEVATION | TOP OF CASING ELEVATION | STICK UP | DEPTH OF SI BASE | WATER DEPTH BELOW TOC | WATER SURFACE ELEVATION |
|----------------|----------|--------------------------------|-------------------------------|-------------|------------------------|-----------------------------|-------------------------------|
| 2786 | 09/30/86 | 5961.86 | 5963.26 | 1.40 | 133.00 | 111.2 | 5852.04 |
| | 10/01/86 | | | | | 130.6 | 5832.66 |
| | 10/13/86 | | | | | 130.5 | 5832.78 |
| | 10/17/86 | | | | | 129.4 | 5833.85 |
| | 10/21/86 | | | | | 127.5 | 5835.76 |
| | 10/28/86 | | | | | 124.2 | 5839.09 |
| | 11/05/86 | | | | | 123.1 | 5840.16 |
| | 11/07/86 | | | | | 131.6 | 5831.66 |
| | 11/26/86 | | | | | 115.9 | 5847.32 |
| | 01/01/87 | | | | | 78.71 | 5884.55 |
| | 02/25/87 | | | | | 99.04 | 5864.22 |
| | 03/19/87 | | | | | 61.25 | 5902.01 |
| | 05/08/87 | | | | | 107.0 | 5856.22 |
| | 06/03/87 | | | | | 88.22 | 5875.04 |
| | 07/08/87 | | | | | 115.2 | 5848.11 |
| | 08/04/87 | | | | | 92.40 | 5870.86 |
| | 09/03/87 | | | | | 74.50 | 5888.76 |
| | 09/22/87 | | | | | 67.60 | 5895.66 |
| | 10/21/87 | | | | | 100.7 | 5862.56 |
| | 11/09/87 | | | | | 87.10 | 5876.16 |
| | 12/22/87 | | | | | 70.10 | 5893.16 |
| | 01/27/88 | | | | | 82.80 | 5880.46 |
| | 02/29/88 | | | | | 70.50 | 5892.76 |
| | 03/21/88 | | | | | 64.40 | 5898.86 |
| | 04/18/88 | | | | | 99.30 | 5863.96 |

SATURATED THICKNESS IN WELL # 27-86(SP)



INDEX OF DATA

Boring No.: 28-86

Completed as well? Yes

Data in File

- ☒ Log of Borehole
- ☒ Well Construction Summaries
- ☐ Well Development Summaries
- ☒ Hydraulic Conductivity Test Data and Results
- ☐ Packer Test Data and Results
- ☒ Water Level Data
- ☒ Saturated Thickness Hydrographs

Project: Rocky Flats Plant


LOG OF BORING NO. 28-86

Date Drilled 8/28/86

Coordinates

Boring Method Hollow Stem Auger

Ground Surface Elevation 5964

| Elev. (feet) | Depth (feet) | Sample Type | Graphic Log | Material Description | Penetration Resistance (Blows/inch) | | Water Content (%) | | Other Tests |
|-----------------|-----------------|----------------|--|--|---|----|-------------------------|----|----------------|
| | | | | | 20 | 40 | 20 | 40 | |
| | 0 | |  | <p>ARTIFICIAL FILL</p> <p>0-1.0'-Sample. Recovered 0.8/1.0'=80%. GRAVEL: grayish orange pink (5YR 7/2) to very pale orange (10YR 8/2) granite, quartzite and sandstone pebbles; sandy; silty, calcareous; poorly sorted; subangular to subrounded; unconsolidated; dry.</p> <p>1.0-2.0'-Sample. Recovered 0.0/1.0'=0%.</p> <p>2.0-4.0'-Sample. Recovered 1.5/2.0'=75%. GRAVEL: Same as above; trace silt and very light gray (N 8) sand; grayish orange (10YR 7/4) gravel layer from 3.5-4.0'; calcareous; poorly sorted; unconsolidated; dry.</p> <p>4.0-5.5'-Sample. Recovered 1.5/1.5'=100%. GRAVEL: Same as above; trace silt and very light gray (N 8) sand; white (N 9) fine silt layer at 4.9'; calcareous; dusky yellow green (5GY 5/2) fine-grained sand and silt layer from 5.4-5.5'; moderately sorted; unconsolidated; dry.</p> <p>5.5-8.0'-Sample. Recovered 0.0/2.5'=0%.</p> | | | | | |
| | 2 | | | | | | | | |
| | 4 | | | | | | | | |
| | 6 | | | | | | | | |
| | 8 | | | | | | | | |

Remarks Logged by: T. Murphy

Checked by: _____

Project No.

106P06222

Hydro-Search, Inc.

Page 1 of 2

Project: Rocky Flats Plant


LOG OF BORING NO. 28-86

Date Drilled 8/28/86

Coordinates

Boring Method Hollow Stem Auger

Ground Surface Elevation 5964

| Elev. (feet) | Depth (feet) | Sample Type | Graphic Log | Material Description | Penetration Resistance (Blows/Inch) | | Water Content (%) | | Other Tests |
|-----------------|-----------------|----------------|---|--|---|----|-------------------------|----|----------------|
| | | | | | 20 | 40 | 20 | 40 | |
| | 8 | |  | 8.0-12.5'-Sample. Recovered 4.5/4.5'=100%. | | | | | |
| | | | | 8.0-8.4'. GRAVEL: Same as above; trace silt and very light gray (N8) sand; poorly sorted; subangular to subrounded; unconsolidated; dry. | | | | | |
| | | | | ARAPAHOE FORMATION | | | | | |
| | 10 | | | 8.4-12.5'. CLAYSTONE: pale olive (10YR 6/2) with dark yellowish orange (10YR 6/6) mottling; trace silt; thin coarse sand lense at 9.1-9.2'; slightly calcareous; weathered; damp. | | | | | |
| | 12 | | | | | | | | |
| | | | | 12.5-15.5'-Sample. Recovered 3.0/3.0'=100%. | | | | | |
| | | | | CLAYSTONE: pale olive (10YR 6/2) with dark yellowish orange (10YR 6/6) mottles; trace silt; weathered; grades downward into brownish gray (5YR 4/1) claystone; damp. | | | | | |
| | 14 | | | | | | | | |
| | | | | | | | | | |
| | 16 | | | TOTAL DEPTH: 15.5' | | | | | |

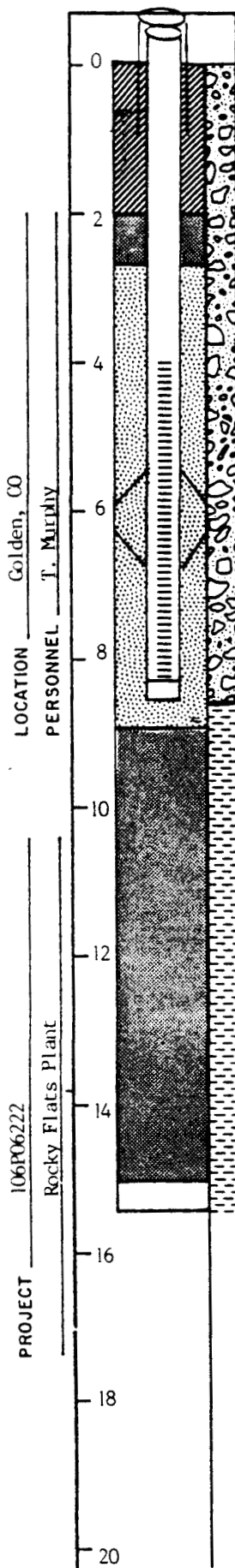
Remarks Logged by: T. Murphy

Checked by: _____

Project No.
106P06222

Hydro-Search, Inc.

Page 2 of 2



WELL CONSTRUCTION SUMMARY

WELL 28-86

LOCATION or COORDS: N 37816.2 E 22137.1

ELEVATION: GROUND LEVEL 5961.23'
TOP OF CASING 5963.77'

DRILLING SUMMARY:

TOTAL DEPTH Well: 8.60' Hole: 15.50'
BOREHOLE DIAMETER 7 1/4"
DRILLER Boyles Brothers Drilling Co.
15865 W. 5th Avenue
Golden, CO (Dave Jarvie)
RIG Mobile B-57
BIT(S) T5
DRILLING FLUID None
SURFACE CASING 5" x 5' steel w/ locking cap

WELL DESIGN:

BASIS: GEOLOGIC LOG X GEOPHYSICAL LOG
CASING STRING(S): C=CASING S=SCREEN
0.00' 4.03' C1
4.03' 8.60' S1

CASING: C1 2" I.D. Sch. 5 type 316 stain-
less steel, threaded and flush
jointed.
SCREEN: S1 2" I.D. Sch. 5 type 316 stain-
less steel, threaded and flush
jointed, 0.010" wire wrap screen
0.25' welded bottom cap.
CENTRALIZERS Type 304 stainless steel
6.75' - 5.55'
FILTER MATERIAL 32-42 silica sand
2.70' - 9.70'
CEMENT Portland Type I
0.00' - 2.00'
OTHER 3/8" bentonite pellets
2.00' - 2.70'
9.70' - 15.10'

CONSTRUCTION TIME LOG:

| TASK | START | | FINISH | |
|---------------------|-------------|-------------|-------------|-------------|
| | DATE | TIME | DATE | TIME |
| DRILLING: | 1986 | | 1986 | |
| <u>7 1/4" auger</u> | <u>8/29</u> | <u>1007</u> | <u>8/29</u> | <u>1230</u> |
| GEOPHYS. LOGGING: | <u> </u> | <u> </u> | <u> </u> | <u> </u> |
| CASING: | | | | |
| <u>2" stainless</u> | <u>8/29</u> | <u>1532</u> | <u>8/29</u> | <u>1532</u> |
| FILTER PLACEMENT: | <u>8/29</u> | <u>1530</u> | <u>8/29</u> | <u>1615</u> |
| CEMENTING: | <u>8/29</u> | <u>1630</u> | <u>8/29</u> | <u>1632</u> |
| DEVELOPMENT: | <u>9/12</u> | <u>1325</u> | <u>9/18</u> | <u>1300</u> |
| OTHER: | | | | |
| <u>Bentonite</u> | <u>8/29</u> | <u>1615</u> | <u>8/29</u> | <u>1630</u> |
| | <u>8/29</u> | <u>1515</u> | <u>8/29</u> | <u>1530</u> |

WELL DEVELOPMENT

See Well Development Summary Sheet.

COMMENTS:

No water encountered during drilling.

Top of stainless steel casing: 2.54'

Cave from TD to 15.10'



SHEET ____ of ____

CLIENT/SUBJECT _____ W.O. NO. _____

TASK DESCRIPTION _____ TASK NO. _____

PREPARED BY _____ DEPT _____ DATE _____

MATH CHECK BY _____ DEPT _____ DATE _____

METHOD REV. BY _____ DEPT _____ DATE _____

APPROVED BY

DEPT _____ DATE _____

WELL 28-86

Hydraulic Conductivity (cm/sec) = NA

Flowrate (gpm) = 0.069

Screened Interval (ft below G.L.) = 6.19 (Static W.L.) - 9.96'

Note TD measured at time of test was 9.96 ft below Ground level This was used in analysis as Base of screened interval. TD. measured June 21, 1988 was 9.47 ft below Ground level.

Method of Analysis: Residual-drawdown Plot

(Driscoll, 1926 - pg 256.)



SHEET ____ of ____

CLIENT/SUBJECT _____ W.O. NO. _____

TASK DESCRIPTION _____ TASK NO. _____

PREPARED BY _____ DEPT _____ DATE _____

MATH CHECK BY _____ DEPT _____ DATE _____

METHOD REV. BY _____ DEPT _____ DATE _____

APPROVED BY

DEPT _____ DATE _____

WELL 28-86

$$T \text{ (gpd/ft)} = \frac{264 Q}{\Delta S'} = \frac{264 (0.0690)}{289} = 6.30 \times 10^{-2}$$

$$\text{where } Q \text{ (gpm)} = 1 \text{ gallon} / 14.5 \text{ min} = 0.0690 \text{ gpm}$$

$$\Delta S' = \text{?} \text{ ft. change in residual drawdown / log cycle} \\ = 289 \text{ ft / log cycle (see attached plot)}$$

$$K \text{ (gpd/ft}^2\text{)} = T / b = 6.30 \times 10^{-2} / 5.8 = 1.09 \times 10^{-2}$$

$$\text{where } b \text{ (ft)} = 11.99 \text{ (D)} - 6.19 = 5.8 \text{ ft}$$

$$K \text{ (cm/sec)} = 1.09 \times 10^{-2} \text{ gpd/ft}^2 \times \frac{4.72 \times 10^{-5} \text{ cm/sec}}{\text{gpd/ft}^2} = 5.1 \times 10^{-7}$$

This method is valid where $u \leq 0.01$

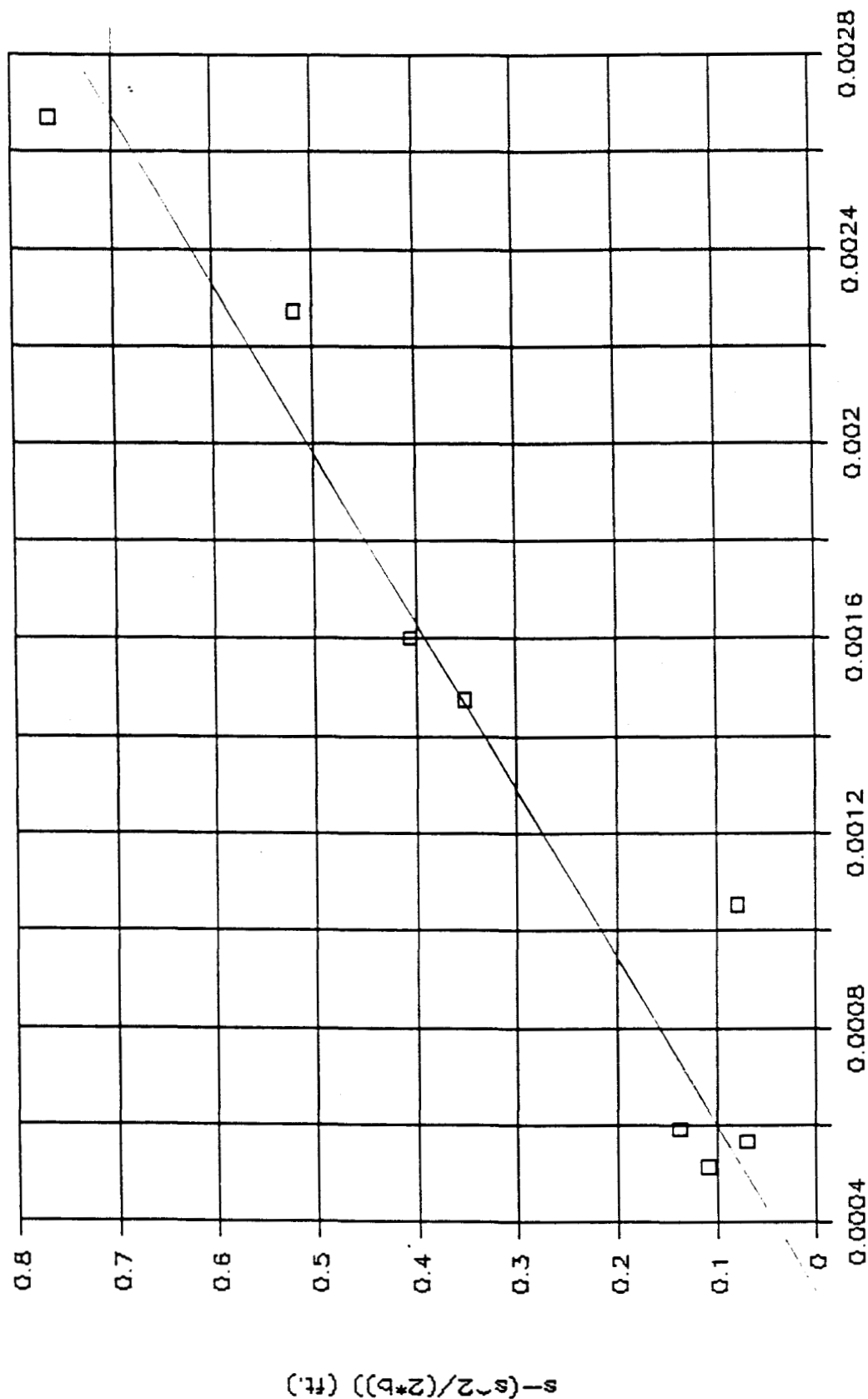
solving for t for $u \leq 0.01$.

$$t \text{ (min)} = \frac{r^2 S}{4 T u} = \frac{(0.302)^2 (0.1)}{4 (1.09 \times 10^{-2}) (0.01)} \times \frac{1440 \text{ min}}{\text{day}} \times \frac{7.482 \text{ gal}}{\text{ft}^3} \\ = 225,376 \text{ min.}$$

$$\text{where } r \text{ (ft)} = \left(\frac{7.25}{24} \right) \text{ ft} = 0.302 \text{ ft}$$

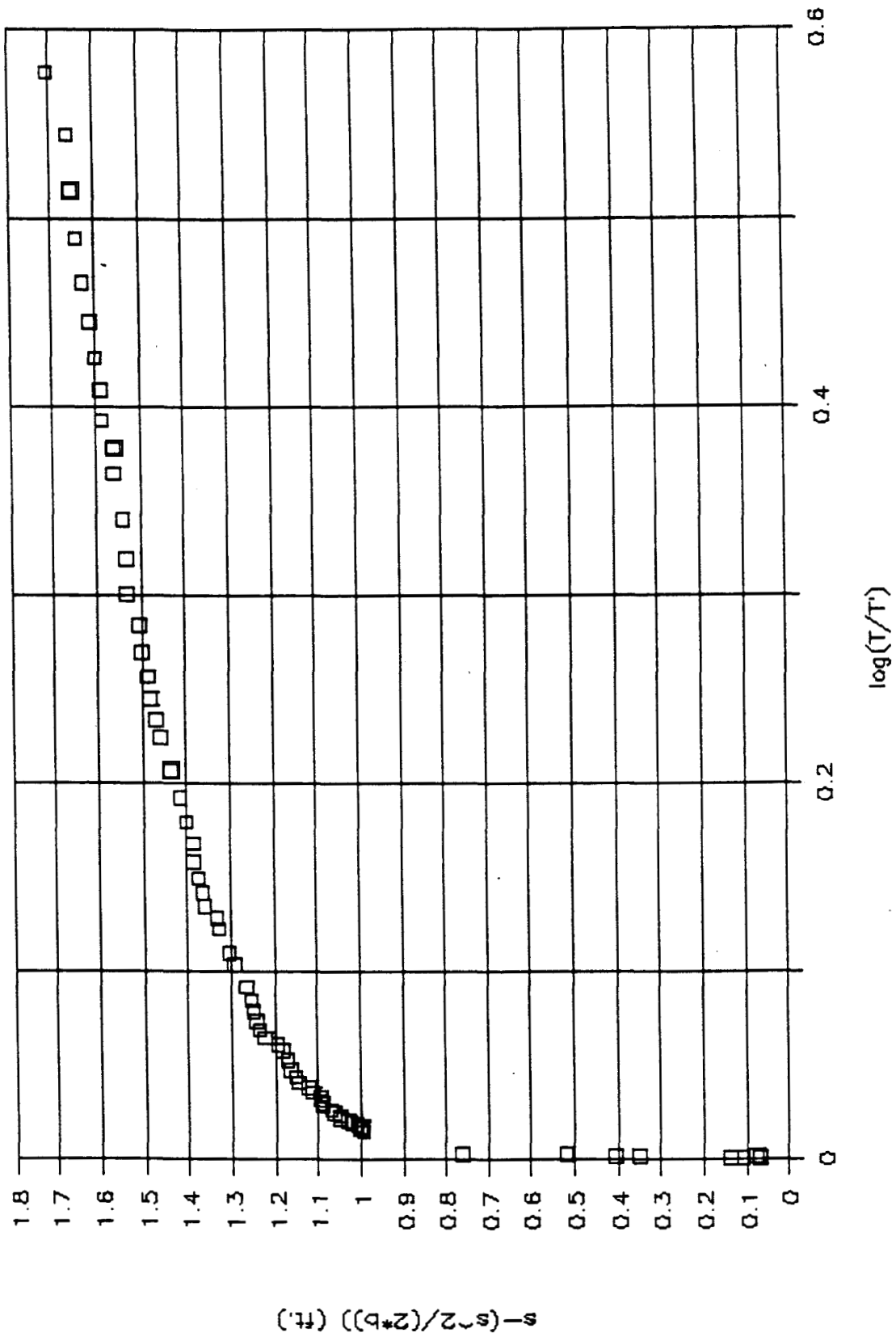
$S = 0.1$ assumed S for unconfined aquifers.
 $\Delta S'$ is invalid.

WELL 28-86

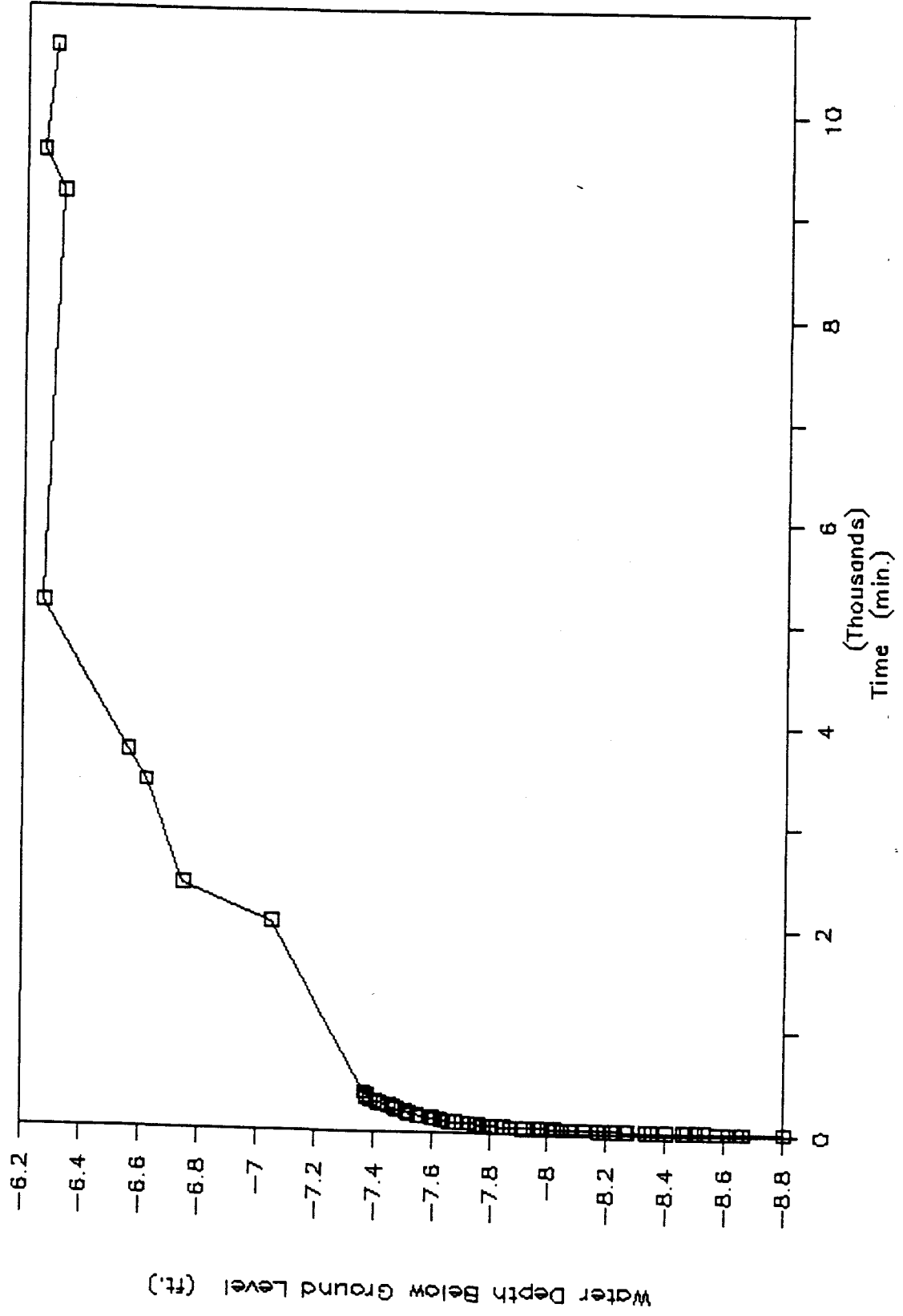


$$\log(T/T') = \frac{(6.736 - 0.043) \text{ ft}}{289 \text{ ft} / \log \text{ cycle}} = \frac{6.693}{289} = 0.02316$$

WELL 28-86



WELL 28-86



| WELL 28-86 | | | | | |
|---------------------|-------------------------|-------------------------|-------------------------|---|-----------|
| T Time (min.) | T' T Prime (min.) | Water Level (ft.) | s' Rsd Drwn (ft.) | s-(S ² /2b) b=2.41 ft. (ft.) | log(T/T') |
| 17.00 | 4.50 | 8.80 | 2.61 | 1.71 | 0.58 |
| 17.50 | 5.00 | 8.66 | 2.47 | 1.66 | 0.54 |
| 18.00 | 5.50 | 8.64 | 2.45 | 1.65 | 0.51 |
| 18.50 | 6.00 | 8.61 | 2.42 | 1.64 | 0.49 |
| 19.00 | 6.50 | 8.57 | 2.38 | 1.63 | 0.47 |
| 19.50 | 7.00 | 8.53 | 2.34 | 1.61 | 0.44 |
| 20.00 | 7.50 | 8.50 | 2.31 | 1.60 | 0.43 |
| 20.50 | 8.00 | 8.47 | 2.28 | 1.59 | 0.41 |
| 21.00 | 8.50 | 8.46 | 2.27 | 1.59 | 0.39 |
| 21.50 | 9.00 | 8.40 | 2.21 | 1.56 | 0.38 |
| 22.00 | 9.50 | 8.40 | 2.21 | 1.56 | 0.36 |
| 23.00 | 10.50 | 8.35 | 2.16 | 1.54 | 0.34 |
| 24.00 | 11.50 | 8.33 | 2.14 | 1.53 | 0.32 |
| 25.00 | 12.50 | 8.33 | 2.14 | 1.53 | 0.30 |
| 26.00 | 13.50 | 8.27 | 2.08 | 1.51 | 0.28 |
| 27.00 | 14.50 | 8.26 | 2.07 | 1.50 | 0.27 |
| 28.00 | 15.50 | 8.23 | 2.04 | 1.49 | 0.26 |
| 29.00 | 16.50 | 8.22 | 2.03 | 1.48 | 0.24 |
| 30.00 | 17.50 | 8.19 | 2.00 | 1.47 | 0.23 |
| 31.00 | 18.50 | 8.17 | 1.98 | 1.46 | 0.22 |
| 33.00 | 20.50 | 8.12 | 1.93 | 1.44 | 0.21 |
| 35.00 | 22.50 | 8.08 | 1.89 | 1.42 | 0.19 |
| 37.00 | 24.50 | 8.05 | 1.86 | 1.40 | 0.18 |
| 39.00 | 26.50 | 8.02 | 1.83 | 1.39 | 0.17 |
| 41.00 | 28.50 | 8.02 | 1.83 | 1.39 | 0.16 |
| 43.00 | 30.50 | 8.00 | 1.81 | 1.38 | 0.15 |
| 45.00 | 32.50 | 7.98 | 1.79 | 1.37 | 0.14 |
| 47.00 | 34.50 | 7.97 | 1.78 | 1.36 | 0.13 |
| 49.00 | 36.50 | 7.92 | 1.73 | 1.33 | 0.13 |
| 51.00 | 38.50 | 7.91 | 1.72 | 1.33 | 0.12 |
| 56.00 | 43.50 | 7.87 | 1.68 | 1.31 | 0.11 |
| 59.00 | 46.50 | 7.85 | 1.66 | 1.29 | 0.10 |
| 66.00 | 53.50 | 7.80 | 1.61 | 1.27 | 0.09 |
| 71.00 | 58.50 | 7.78 | 1.59 | 1.25 | 0.08 |
| 76.00 | 63.50 | 7.77 | 1.58 | 1.25 | 0.08 |
| 81.00 | 68.50 | 7.76 | 1.57 | 1.24 | 0.07 |
| 86.00 | 73.50 | 7.75 | 1.56 | 1.24 | 0.07 |
| 91.00 | 78.50 | 7.73 | 1.54 | 1.23 | 0.06 |
| 96.00 | 83.50 | 7.68 | 1.49 | 1.20 | 0.06 |
| 101.00 | 88.50 | 7.66 | 1.47 | 1.18 | 0.06 |
| 111.00 | 98.50 | 7.64 | 1.45 | 1.17 | 0.05 |
| 121.00 | 108.50 | 7.63 | 1.44 | 1.16 | 0.05 |

| WELL 28-86 | | | | | |
|---------------------|-------------------------|-------------------------|-------------------------|-----------------------------------|-----------|
| T Time (min.) | T' T Prime (min.) | Water Level (ft.) | s' Rsd Drwn (ft.) | s-(S^2/2b) b=2.41 ft. (ft.) | log(T/T') |
| 131.00 | 118.50 | 7.61 | 1.42 | 1.15 | 0.04 |
| 141.00 | 128.50 | 7.60 | 1.41 | 1.15 | 0.04 |
| 151.00 | 138.50 | 7.56 | 1.37 | 1.12 | 0.04 |
| 161.00 | 148.50 | 7.55 | 1.36 | 1.11 | 0.04 |
| 171.00 | 158.50 | 7.52 | 1.33 | 1.10 | 0.03 |
| 181.00 | 168.50 | 7.52 | 1.33 | 1.10 | 0.03 |
| 191.00 | 178.50 | 7.51 | 1.32 | 1.09 | 0.03 |
| 201.00 | 188.50 | 7.51 | 1.32 | 1.09 | 0.03 |
| 216.00 | 203.50 | 7.48 | 1.29 | 1.07 | 0.03 |
| 231.00 | 218.50 | 7.47 | 1.28 | 1.06 | 0.02 |
| 246.00 | 233.50 | 7.45 | 1.26 | 1.05 | 0.02 |
| 261.00 | 248.50 | 7.45 | 1.26 | 1.05 | 0.02 |
| 276.00 | 263.50 | 7.42 | 1.23 | 1.03 | 0.02 |
| 291.00 | 278.50 | 7.41 | 1.22 | 1.02 | 0.02 |
| 306.00 | 293.50 | 7.39 | 1.20 | 1.01 | 0.02 |
| 321.00 | 308.50 | 7.38 | 1.19 | 1.00 | 0.02 |
| 336.00 | 323.50 | 7.38 | 1.19 | 1.00 | 0.02 |
| 351.00 | 338.50 | 7.38 | 1.19 | 1.00 | 0.02 |
| 381.00 | 368.50 | 7.37 | 1.18 | 1.00 | 0.01 |
| 2039.00 | 2026.50 | 7.05 | 0.86 | 0.76 | 0.00 |
| 2397.00 | 2384.50 | 6.75 | 0.56 | 0.52 | 0.00 |
| 3396.00 | 3383.50 | 6.62 | 0.43 | 0.41 | 0.00 |
| 3689.00 | 3676.50 | 6.56 | 0.37 | 0.35 | 0.00 |
| 5159.00 | 5146.50 | 6.27 | 0.08 | 0.08 | 0.00 |
| 9188.00 | 9175.50 | 6.33 | 0.14 | 0.14 | 0.00 |
| 9588.00 | 9575.50 | 6.26 | 0.07 | 0.07 | 0.00 |
| 10605.00 | 10592.50 | 6.30 | 0.11 | 0.11 | 0.00 |

AQUIFER TEST DATA

WELL RE-86
PUMPING or OBSERVATION WELL
PUMPING or RECOVERY DATA
PAGE 1 OF 2

Finished
10:04:30

TYPE OF AQUIFER TEST Basin Water Recovery Test
HOW Q MEASURED 1.5m E. 11.5
HOW W.L.'s MEASURED CHARTER
RAD./DIST. OF/FROM PUMPING WELL 1
MEAS. POINT FOR W.L.'s
ELEVATION OF MEAS. POINT SU = 2.036 top of cement

DEPTH OF PUMP/AIRPIPE
PUMP ON: date 11-11-50 time
PUMP OFF: date 11-11-50 time
DURATION OF AQUIFER TEST

LOCATION
PERSONNEL

PROJECT

| TIME | | | | WATER LEVEL DATA | | | | DISCHARGE | | RECORDED BY | COMMENTS |
|---------------------|------------|-----|----|---|------------------------|-------------|---------|-----------|---|-------------|------------------|
| t = _____ at t' = 0 | | | | STATIC WATER LEVEL <u>5+3.22 - 2.03</u> | | | | | | | |
| DAY | CLOCK TIME | t | t' | READING | CONVERSION CORRECTIONS | WATER LEVEL | s or s' | READING | Q | | |
| / | 10:05 | 1/2 | | 10+83 | -2.03 | 8.8 | 2.61 | | | | TD. 11.25.14.205 |
| | 10:05:30 | 1 | | 10+69 | -2.03 | 8.66 | 2.97 | | | | Bearing 1st |
| | 10:06 | 1.5 | | 10+67 | " | 8.64 | 2.45 | | | | |
| | 10:06:30 | 2 | | 10+64 | " | 8.61 | 2.92 | | | | Finished bearing |
| | 10:07 | 2.5 | | 10+60 | " | 8.57 | 2.38 | | | | 10:04:30 |
| | 10:08:30 | 3 | | 10+56 | | 8.53 | 2.34 | | | | |
| | 10:08 | 3.5 | | 10+53 | | 8.5 | 2.31 | | | | started bailer |
| | 10:08:30 | 4 | | 10+50 | | 8.47 | 2.28 | | | | 9:48 |
| | 10:09 | 4.5 | | 10+49 | | 8.46 | 2.27 | | | | |
| | 10:09:30 | 5 | | 10+43 | | 8.40 | 2.21 | | | | |
| | 10:10 | 6 | | 10+43 | | 8.40 | 2.21 | | | | |
| | 10:11 | 7 | | 10+38 | | 8.35 | 2.16 | | | | |
| | 10:12 | 8 | | 10+33.8 | | 8.303 | 2.113 | | | | |
| | 10:13 | 9 | | 10+33.3 | | 8.303 | 2.113 | | | | |
| | 10:14 | 10 | | 10+30 | | 8.27 | 2.08 | | | | |
| | 10:15 | 11 | | 10+29 | | 8.26 | 2.07 | | | | |
| | 10:16 | 12 | | 10+26 | | 8.23 | 2.04 | | | | |
| | 10:17 | 13 | | 10+25 | | 8.22 | 2.03 | | | | |
| | 10:18 | 14 | | 10+22 | | 8.19 | 2.0 | | | | |
| | 10:19 | 15 | | 10+20 | | 8.17 | 1.98 | | | | |
| | 10:20 | 17 | | 10+15 | | 8.12 | 1.93 | | | | |
| | 10:23 | 19 | | 10+11 | | 8.08 | 1.89 | | | | |
| | 10:25 | 20 | | 10+08 | | 8.05 | 1.86 | | | | |
| | 10:27 | 23 | | 10+05 | | 8.02 | 1.83 | | | | |
| | 10:29 | 25 | | 10+05 | | 8.02 | 1.83 | | | | |
| | 10:31 | 27 | | 10+03 | | 8.00 | 1.81 | | | | |
| | 10:33 | 29 | | 10+01 | | 7.98 | 1.79 | | | | |
| | 10:35 | 31 | | 10+00 | | 7.97 | 1.78 | | | | |
| | 10:37 | 33 | | 10+05 | | 7.92 | 1.73 | | | | |
| | 10:39 | 35 | | 10+06 | | 7.91 | 1.72 | | | | |
| | 10:40 | 40 | | 10-10 | | 7.87 | 1.68 | | | | |
| | 10:45 | 45 | | 10-12 | | 7.85 | 1.66 | | | | |
| | 10:54 | 50 | | 10-17 | | 7.8 | 1.61 | | | | |
| | 10:59 | 55 | | 10-19 | | 7.78 | 1.59 | | | | |
| | 11:04 | 60 | | 10-20 | | 7.77 | 1.58 | | | | |
| | 11:09 | 65 | | 10-21 | | 7.76 | 1.57 | | | | |
| | 11:14 | 70 | | 10-22 | | 7.75 | 1.56 | | | | |
| | 11:19 | 75 | | 10-24 | | 7.73 | 1.54 | | | | |
| | 11:24 | 80 | | 10-29 | | 7.68 | 1.49 | | | | |
| | 11:29 | 85 | | 10-31.5 | | 7.65 | 1.465 | | | | |
| | 11:39 | 95 | | 10-38 | | 7.64 | 1.45 | | | | |

AQUIFER TEST DATA

WELL 2B-30
 PUMPING or OBSERVATION WELL
 PUMPING or RECOVERY DATA
 PAGE 2 OF 2

TYPE OF AQUIFER TEST _____
 HOW Q MEASURED _____
 HOW W.L.'s MEASURED _____
 RAD./DIST. OF/FROM PUMPING WELL _____
 MEAS. POINT FOR W.L.'s _____
 ELEVATION OF MEAS. POINT _____

DEPTH OF PUMP/AIRPIPE _____
 PUMP ON: date 11-11-86 time 9:48:10
 PUMP OFF: date 11-11-86 time 10:04:30
 DURATION OF AQUIFER TEST _____

| TIME | | | | | WATER LEVEL DATA | | | | | DISCHARGE | | RECORDED BY | COMMENTS |
|---------------------|------------|-----|----|--|--------------------|------------------------|-------------|---------|--|-----------|---|-------------|----------|
| t = _____ at t' = 0 | | | | | STATIC WATER LEVEL | | | | | | | | |
| DAY | CLOCK TIME | t | t' | | READING | CONVERSION CORRECTIONS | WATER LEVEL | s or s' | | READING | Q | | |
| | 1149 | 105 | | | 10-.34 | -2.03 | 7.63 | 1.44 | | | | | |
| | 1159 | 115 | | | 10-.365 | " | 7.605 | 1.415 | | | | | |
| | 1209 | 125 | | | 10-.375 | " | 7.595 | 1.405 | | | | | |
| | 1219 | 135 | | | 10-.41 | | 7.56 | 1.37 | | | | | |
| | 1229 | 145 | | | 10-.425 | | 7.545 | 1.355 | | | | | |
| | 1239 | 155 | | | 10-.45 | | 7.52 | 1.33 | | | | | |
| | 1249 | 165 | | | 10-.45 | | 7.52 | 1.33 | | | | | |
| | 1259 | 175 | | | 10-.46 | | 7.51 | 1.32 | | | | | |
| | 1309 | 185 | | | 10-.465 | | 7.505 | 1.315 | | | | | |
| | 1324 | 200 | | | 10-.495 | | 7.475 | 1.285 | | | | | |
| | 1334 | 215 | | | 10-.50 | | 7.47 | 1.28 | | | | | |
| | 1354 | 230 | | | 10-.52 | | 7.45 | 1.26 | | | | | |
| | 1409 | 245 | | | 10-.525 | | 7.445 | 1.255 | | | | | |
| | 1429 | 260 | | | 10-.55 | | 7.42 | 1.23 | | | | | |
| | 1439 | 275 | | | 10-.5465 | | 7.405 | 1.215 | | | | | |
| | 1459 | 290 | | | 10-.585 | | 7.385 | 1.195 | | | | | |
| | 1509 | 305 | | | 10-.590 | | 7.38 | 1.190 | | | | | |
| | 1529 | 320 | | | 10-.590 | | 7.38 | 1.190 | | | | | |
| 1 | 1539 | 335 | | | 10-.590 | | 7.38 | 1.19 | | | | | |
| 1 | 1609 | 365 | | | 10-.60 | | 7.37 | 1.18 | | | | | |
| 2 | 9:47 | | | | 5+4.08 | -2.03 | | | | | | | |
| 2 | 15:45 | | | | 5+3.78 | | | | | | | | |
| 3 | 8:24 | | | | 5+3.65 | | | | | | | | |
| 3 | 13:17 | | | | 5+3.59 | | | | | | | | |
| 4 | 13:47 | | | | 5+3.30 | | | | | | | | |
| 7 | 8:56 | | | | 5+3.36 | | | | | | | | |
| 7 | 15:36 | | | | 5+3.29 | | | | | | | | |
| 8 | 8:33 | | | | 5+3.33 | | | | | | | | |
| 8 | | | | | | | | | | | | | |
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HYDRO-SEARCH

RENO-DENVER

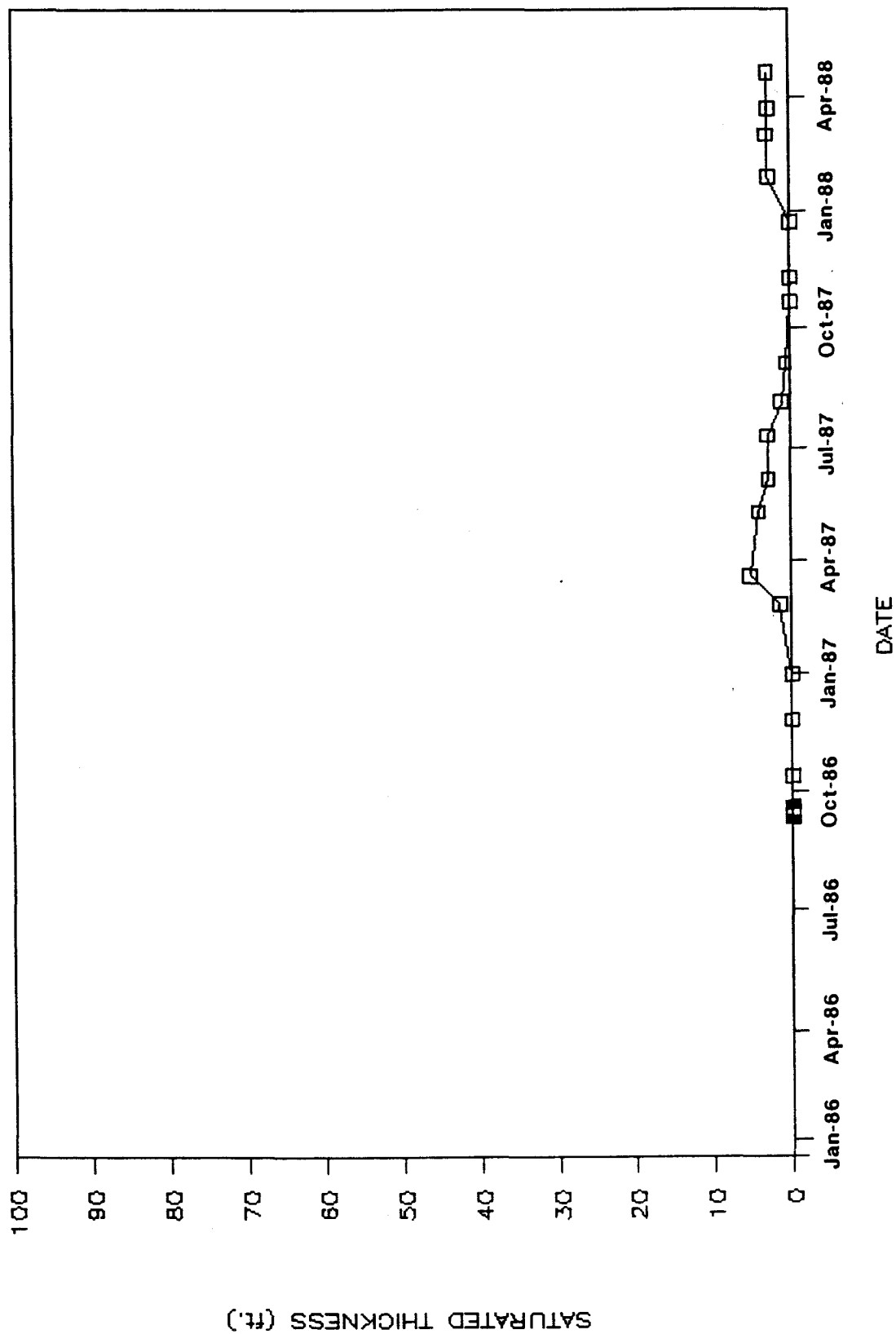
CONSULTING HYDROLOGISTS-GEOLOGISTS

ROCKY FLATS SOLAR PONDS

WATER LEVEL SUMMARY

| <u>WELL NUMBER</u> | <u>DATE</u> | <u>GROUND SURFACE ELEVATION</u> | <u>TOP OF CASING ELEVATION</u> | <u>STICK UP</u> | <u>DEPTH OF SI BASE</u> | <u>WATER DEPTH BELOW TOC</u> | <u>WATER SURFACE ELEVATION</u> |
|------------------------|-------------|---|--|---------------------|---------------------------------|--------------------------------------|--|
| 2886 | 09/12/86 | 5961.23 | 5963.77 | 2.54 | 8.60 | 10.54 | 5953.23 |
| | 09/13/86 | | | | | 10.67 | 5953.10 |
| | 09/15/86 | | | | | 10.36 | 5953.41 |
| | 09/16/86 | | | | | 10.78 | 5952.99 |
| | 09/17/86 | | | | | 10.80 | 5952.97 |
| | 09/18/86 | | | | | 10.63 | 5953.14 |
| | 10/13/86 | | | | | 9.10 | 5954.67 |
| | 11/26/86 | | | | | 8.51 | 5955.26 |
| | 01/01/87 | | | | | 8.79 | 5954.98 |
| | 02/25/87 | | | | | 7.00 | 5956.77 |
| | 03/19/87 | | | | | 3.25 | 5960.52 |
| | 05/08/87 | | | | | 4.38 | 5959.39 |
| | 06/03/87 | | | | | 5.73 | 5958.04 |
| | 07/08/87 | | | | | 5.65 | 5958.12 |
| | 08/04/87 | | | | | 7.40 | 5956.37 |
| | 09/03/87 | | | | | 8.00 | 5955.77 |
| | 10/21/87 | | | | | 8.90 | 5954.87 |
| | 11/09/87 | | | | | 8.70 | 5955.07 |
| | 12/22/87 | | | | | 8.70 | 5955.07 |
| | 01/27/88 | | | | | 5.80 | 5957.97 |
| | 02/29/88 | | | | | 5.60 | 5958.17 |
| | 03/21/88 | | | | | 5.80 | 5957.97 |
| | 04/18/88 | | | | | 5.70 | 5958.07 |

SATURATED THICKNESS IN WELL # 28-86 (SP)



INDEX OF DATA

Boring No.: 29-86

Completed as well? Yes

Data in File

- ☒ Log of Borehole
- ☒ Well Construction Summaries
- ☐ Well Development Summaries
- ☐ Hydraulic Conductivity Test Data and Results
- ☐ Packer Test Data and Results
- ☒ Water Level Data
- ☒ Saturated Thickness Hydrographs

Project: Rocky Flats Plant

LOG OF BORING NO. 29-86

Date Drilled 9/9/86

Coordinates N 37610.3 E 22584.1

Boring Method Hollow Stem Auger

Ground Surface Elevation 5958.26

| Elev. (feet) | Depth (feet) | Sample Type | Graphic Log | Material Description | Penetration Resistance (Blows/Inch) | | Water Content (%) | | Other Tests |
|-----------------|-----------------|----------------|----------------|--|---|----|-------------------------|----|----------------|
| | | | | | 20 | 40 | 20 | 40 | |
| | 0 | | | ROCKY FLATS ALLUVIUM | | | | | |
| | | | | 0.0-2.0'-Sample. Recovered 0.5/2.0'=25%. GRAVEL: grayish brown (5YR 3/2) to dusky brown (5YR 2/2) granite and quartzite pebbles and cobbles; sand and silt matrix; bimodal sorting; subangular; unconsolidated; loose; damp. | | | | | |
| | 5 | | | 2.0-3.6'-Sample. Recovered 1.6/1.6'=100%. GRAVEL: moderate brown (5YR 4/4) granite and quartzite pebbles and cobbles; sandy; some silt; poorly sorted; subangular; well packed; damp. | | | | | |
| | | | | 3.6-6.5'-Sample. Recovered 0.0/3.0'=0%. Cuttings. GRAVEL: light brown (5YR 5/6) granite and quartzite pebbles and cobbles; unconsolidated; dry. | | | | | |
| | 10 | | | 6.5-7.5'-Sample. GRAVEL: light brown (5YR 6/4) granitic pebbles and cobbles; medium to coarse sand; poorly sorted; angular; unconsolidated; dry to damp. | | | | | |
| | | | | 7.5-12.5'-Sample. Recovered 4.3/5.0'=86%. 7.5-8.7'. CLAY: olive gray (5Y 3/2) and grayish brown (9YR 2/2); gravelly; some sand and silt; caliche stringers; soft; moist. | | | | | |
| | 15 | | | ARAPAHOE FORMATION | | | | | |
| | | | | 8.7-12.5'. CLAYSTONE: yellowish gray (5Y 7/2) to dusky yellow (5Y 6/4); silty; weathered; firm; moist. | | | | | |
| | 20 | | | | | | | | |

Remarks Logged by: T. Murphy

Checked by: Project No.
106P06222

Hydro-Search, Inc.

Page 1 of 2

Project: Rocky Flats Plant

LOG OF BORING NO. 29-86

Date Drilled 9/9/86

Coordinates N 37610.3 E 22584.1

Boring Method Hollow Stem Auger

Ground Surface Elevation 5958.26

| Elev. (feet) | Depth (feet) | Sample Type | Graphic Log | Material Description | Penetration Resistance (Blows/Inch) | | Water Content (%) | | Other Tests |
|-----------------|-----------------|----------------|----------------|---|---|----|-------------------------|----|----------------|
| | | | | | 20 | 40 | 20 | 40 | |
| | 20 | | | 12.5-17.5'-Sample. Recovered 5.0/5.0'=100%. CLAYSTONE: pale olive (10Y 6/2) with dark yellowish orange (10YR 6/6) mottling; fine-grained to coarse-grained sand stringers; occasional calcite in fractures (dark yellowish orange 10YR 6/6); 50% sand and 50% claystone; firm; moist. | | | | | |
| | 25 | | | 17.5-22.5'-Sample. Recovered 2.0/5.0'=40%. SANDSTONE: dark yellowish orange (10YR 6/6) and light gray (N 7); silty; some clay; moist; soft. | | | | | |
| | | | | 22.5-25.5'. Lost core. | | | | | |
| | | | | TOTAL DEPTH: 25.5' | | | | | |
| | 30 | | | | | | | | |
| | 35 | | | | | | | | |
| | 40 | | | | | | | | |

Remarks Logged by: T. Murphy

Checked by: *[Signature]*

Project No.
106P06222

Hydro-Search, Inc.

Page 2 of 2

WELL 29-86

WELL CONSTRUCTION SUMMARY

LOCATION or COORDS: _____
N 37610.3 E 22584.1ELEVATION: GROUND LEVEL 5958.26'
TOP OF CASING 5959.95'

DRILLING SUMMARY:

TOTAL DEPTH Well: 8.77' Hole: 22.50'
BOREHOLE DIAMETER 7½"DRILLER Boyles Brothers Drilling Co.
15865 W. 5th Avenue
Golden, CO (Dave Jarvie)

RIG Mobile B-57

BIT(S) T5

DRILLING FLUID None

SURFACE CASING 5" x 4" steel w/ locking
cap

WELL DESIGN:

BASIS: GEOLOGIC LOG X GEOPHYSICAL LOG _____

CASING STRING(S): C=CASING S=SCREEN

0.00' 2.83' C1 _____

2.83' 8.77' S1 _____

_____ _____

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CONSTRUCTION TIME LOG:

| TASK | START | | FINISH | |
|-------------------|--------------|------|--------------|------|
| | DATE 1986 | TIME | DATE 1986 | TIME |
| DRILLING: | | | | |
| 7½" auger | 9/9 | 1230 | 9/9 | 1410 |
| | | | | |
| GEOPHYS. LOGGING: | — | — | — | — |
| CASING: | | | | |
| 2" stainless | 9/9 | 1550 | 9/9 | 1552 |
| | | | | |
| FILTER PLACEMENT: | 9/9 | 1600 | 9/9 | 1605 |
| CEMENTING: | 9/9 | 1610 | 9/9 | 1615 |
| DEVELOPMENT: | 9/12 | 1410 | 9/12 | 1410 |
| OTHER: | | | | |
| Bentonite | 9/9 | 1605 | 9/9 | 1610 |
| | 9/9 | 1540 | 9/9 | 1542 |
| | | | | |
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WELL DEVELOPMENT

See Well Development Summary Sheet.

COMMENTS:

No water encountered during drilling.

Top of stainless steel casing: 1.69'

Cave from TD to 20.30'

LOCATION Golden, CO
PERSONNEL T. MurphyPROJECT 106P06222
Rocky Flats Plant

HYDRO-SEARCH RENO-DENVER

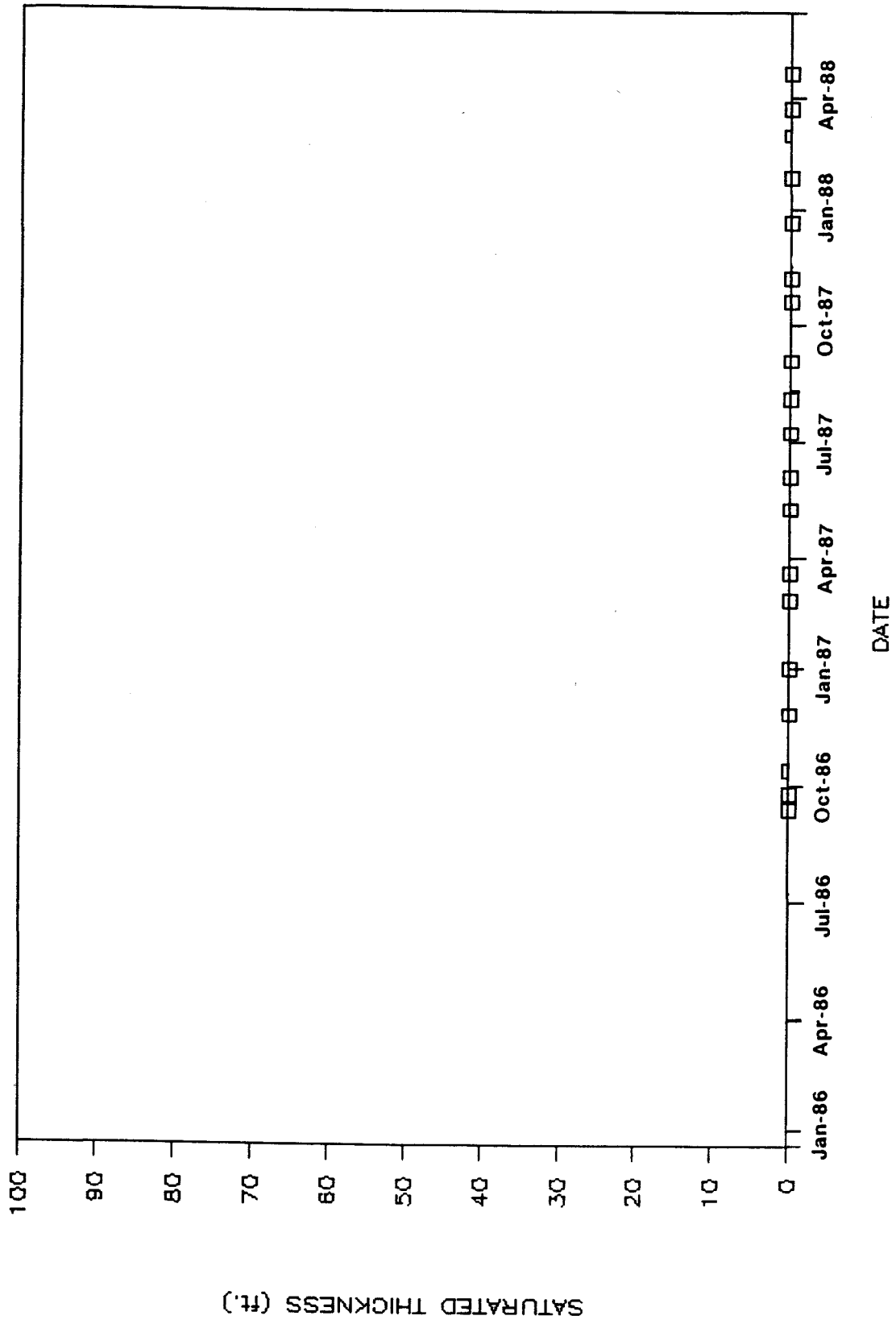
CONSULTING HYDROLOGISTS-GEOLOGISTS

ROCKY FLATS SOLAR PONDS

WATER LEVEL SUMMARY

| <u>WELL</u> <u>NUMBER</u> | <u>DATE</u> | <u>GROUND</u> <u>SURFACE</u> <u>ELEVATION</u> | <u>TOP OF</u> <u>CASING</u> <u>ELEVATION</u> | <u>STICK</u> <u>UP</u> | <u>DEPTH</u> <u>OF SI</u> <u>BASE</u> | <u>WATER</u> <u>DEPTH</u> <u>BELOW TOC</u> | <u>WATER</u> <u>SURFACE</u> <u>ELEVATION</u> |
|------------------------------|-------------|---|--|---------------------------|---|--|--|
| 2986 | 09/12/86 | 5958.26 | 5959.95 | 1.69 | 8.77 | -1.00 | DRY |
| | 09/24/86 | | | | | -1.00 | DRY |
| | 09/24/86 | | | | | -1.00 | DRY |
| | 10/13/86 | | | | | -1.00 | DRY |
| | 11/26/86 | | | | | -1.00 | DRY |
| | 01/01/87 | | | | | -1.00 | DRY |
| | 02/25/87 | | | | | -1.00 | DRY |
| | 03/19/87 | | | | | -1.00 | DRY |
| | 05/08/87 | | | | | 8.85 | 5951.10 |
| | 06/03/87 | | | | | 9.82 | 5950.13 |
| | 07/08/87 | | | | | -1.00 | DRY |
| | 08/04/87 | | | | | -1.00 | DRY |
| | 09/03/87 | | | | | -1.00 | DRY |
| | 10/21/87 | | | | | -1.00 | DRY |
| | 11/09/87 | | | | | -1.00 | DRY |
| | 12/22/87 | | | | | -1.00 | DRY |
| | 01/27/88 | | | | | -1.00 | DRY |
| | 02/29/88 | | | | | -1.00 | DRY |
| | 03/21/88 | | | | | -1.00 | DRY |
| | 04/18/88 | | | | | -1.00 | DRY |

SATURATED THICKNESS IN WELL # 29-86 (SP)



INDEX OF DATA

Boring No.: 30-86

Completed as well? Yes

Data in File

- ☒ Log of Borehole
- ☒ Well Construction Summaries
- ☐ Well Development Summaries
- ☒ Hydraulic Conductivity Test Data and Results
- ☐ Packer Test Data and Results
- ☒ Water Level Data
- ☒ Saturated Thickness Hydrographs

Project: Rocky Flats Plant

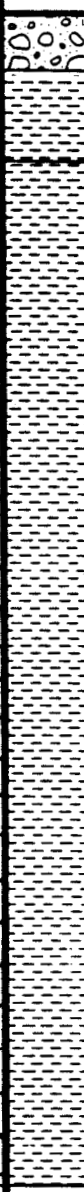
LOG OF BORING NO. 30-86

Date Drilled 9/6/86

Coordinates N 38092.5 E 21819.6

Boring Method .Hollow Stem Auger

Ground Surface Elevation 5956.21

| Elev. (feet) | Depth (feet) | Sample Type | Graphic Log | Material Description | Penetration Resistance (Blows/Inch) | | Water Content (%) | | Other Tests |
|-----------------|-----------------|----------------|--|---|---|----|-------------------------|----|----------------|
| | | | | | 20 | 40 | 20 | 40 | |
| | 0 | |  | <p>ARTIFICIAL FILL</p> <p>0.0-2.0'-Sample. Recovered 1.2/2.0'=60%. 0.0-0.8'. GRAVEL: granite and quartzite pebbles; sandy; silty; poorly sorted; wet.</p> <p>0.8-2.0'. CLAYSTONE: dusky brown (5Y 2/2) and olive gray (5Y 3/2); silty; moist to wet.</p> <p>ARAPAHOE FORMATION</p> <p>2.0-4.0'-Sample. Recovered 2.0/2.0'=100%. CLAYSTONE: light olive gray (5Y 5/2); some dark yellowish orange (10YR 6/6) iron staining; slightly calcareous; silty; firm; moist.</p> <p>4.0-6.0'-Sample. Recovered 2.0/2.0'=100%. CLAYSTONE: light olive gray (5Y 5/2); some dark yellowish orange (10YR 6/6) iron staining; fragments of calcite; some light olive gray (5Y 5/2) fine-grained sand; soft to moderately firm; moist.</p> <p>6.0-11.0'-Sample. Recovered 5.0/5.0'=100%. CLAYSTONE: light olive gray (5Y 5/2); some dark yellowish orange (10YR 6/6) iron stains; calcite concretion at 6.3'; firm; damp.</p> <p>11.0-16.0'-Sample. Recovered 5.0/5.0'=100%. CLAYSTONE: olive gray (5Y 3/2) to olive brown (5Y 4/4); firm; damp.</p> <p>TOTAL DEPTH: 16.0'</p> | | | | | |
| | 5 | | | | | | | | |
| | 10 | | | | | | | | |
| | 15 | | | | | | | | |
| | 20 | | | | | | | | |

Remarks Logged by: T. Murphy

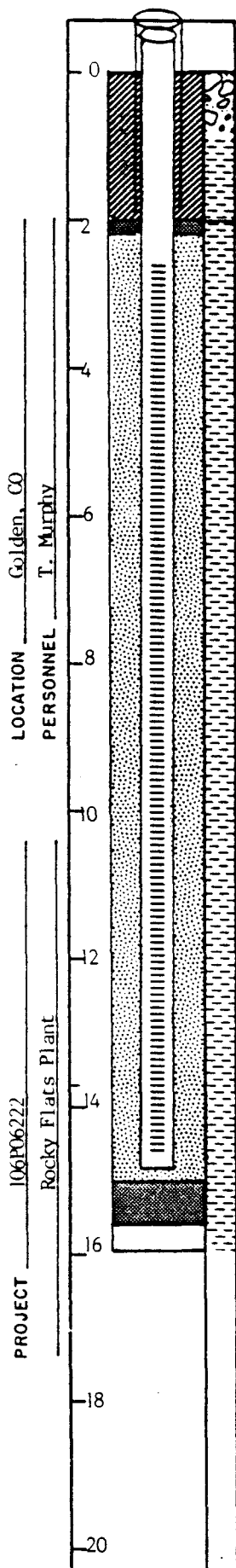
Checked by: 

Project No.

106P06222

Hydro-Search, Inc.

Page 1 of 1



WELL CONSTRUCTION SUMMARY

LOCATION or COORDS: N 38092.5 E 21819.6

WELL 30-86
ELEVATION: GROUND LEVEL 5956.21'
TOP OF CASING 5957.62'

DRILLING SUMMARY:

TOTAL DEPTH Well: 14.93' Hole: 16.00'
BOREHOLE DIAMETER 7 1/4"
DRILLER Boyles Brothers Drilling Co.
15865 W. 5th Avenue
Golden, CO (Dave Jarvie)
RIG Mobile B-57
BIT(S) Blade bit
DRILLING FLUID None
SURFACE CASING 5" x 4" steel w/ locking cap

WELL DESIGN:

BASIS: GEOLOGIC LOG X GEOPHYSICAL LOG
CASING STRING(S): C=CASING S=SCREEN
0.00' 2.48' CI
2.48' 14.93' SI

CASING: CI 2" I.D. Sch. 5 type 316 stain-
less steel, threaded and flush
jointed.
SCREEN: SI 2" I.D. Sch. 5 type 316 stain-
less steel, threaded and flush
jointed, 0.010" wire wrap screen
0.25' welded bottom cap.
CENTRALIZERS Type 304 stainless steel
FILTER MATERIAL 32-42 silica sand
2.20' - 15.10'
CEMENT Portland Type I
0.00' - 2.00'
OTHER 3/8" bentonite pellets
2.00' - 2.20'
15.10' - 15.60'

CONSTRUCTION TIME LOG:

| TASK | START | | FINISH | |
|---------------------|-------------|-------------|-------------|-------------|
| | DATE | TIME | DATE | TIME |
| DRILLING: | 1986 | | 1986 | |
| <u>7 1/4" auger</u> | <u>9/6</u> | <u>1200</u> | <u>9/6</u> | <u>1430</u> |
| | | | | |
| GEOPHYS. LOGGING: | | | | |
| CASING: | | | | |
| <u>2" stainless</u> | <u>9/6</u> | <u>1630</u> | <u>9/6</u> | <u>1635</u> |
| | | | | |
| FILTER PLACEMENT: | <u>9/6</u> | <u>1635</u> | <u>9/6</u> | <u>1650</u> |
| CEMENTING: | <u>9/6</u> | <u>1650</u> | <u>9/6</u> | <u>1700</u> |
| DEVELOPMENT: | <u>9/12</u> | <u>1010</u> | <u>9/19</u> | <u>1030</u> |
| OTHER: | | | | |
| <u>Bentonite</u> | <u>9/6</u> | <u>1641</u> | <u>9/6</u> | <u>1642</u> |
| | <u>9/6</u> | <u>1625</u> | <u>9/6</u> | <u>1630</u> |
| | | | | |
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WELL DEVELOPMENT

See Well Development Summary Sheet.

COMMENTS:

No water encountered during drilling.

Top of stainless steel casing: 1.41'

Cave from TD to 15.60'



SHEET ____ of ____

CLIENT/SUBJECT _____ W.O. NO. _____

TASK DESCRIPTION _____ TASK NO. _____

PREPARED BY _____ DEPT _____ DATE _____

MATH CHECK BY _____ DEPT _____ DATE _____

METHOD REV. BY _____ DEPT _____ DATE _____

APPROVED BY

DEPT _____ DATE _____

WELL 30-86

Hydraulic Conductivity (cm/sec) = NA

Flowrate (gpm) = 0.22

Screened Interval (ft below G.L.) = 4.11 (Static W.L.) - 14.93'

Method of Analysis: Residual-drawdown Plot
(Driscoll, 1986 - pg 256).

CLIENT/SUBJECT _____ W.O. NO. _____

TASK DESCRIPTION _____ TASK NO. _____

PREPARED BY _____ DEPT _____ DATE _____

MATH CHECK BY _____ DEPT _____ DATE _____

METHOD REV. BY _____ DEPT _____ DATE _____

| | |
|-------------|------------|
| APPROVED BY | |
| | |
| DEPT _____ | DATE _____ |

WELL 30-86

$$T \text{ (gpd/ft)} = \frac{264 Q}{\Delta S'} = \frac{(264) (.22)}{294} = .198$$

where $Q \text{ (gpm)} = 2.75 \text{ gallon} / 12.5 \text{ minutes} = 0.22 \text{ gpm}$

$$\Delta S' = -2t \cdot \text{change in residual drawdown} / \log \text{ cycle}$$

$$= 294' / \log \text{ cycle (see attached plot)}$$

$$K \text{ (gpd/ft}^2\text{)} = T/b = 0.198 / 10.82 = 0.0183$$

where $b \text{ (ft)} = 14.93 - 4.11 \text{ (static W.L.)} = 10.82 \text{ ft}$

$$K \text{ (cm/sec)} = 0.0183 \text{ gpd/ft}^2 \times \frac{4.72 \times 10^{-5} \text{ cm/sec}}{\text{gpd/ft}^2} = 8.6 \times 10^{-7}$$

This method is valid where $u \leq 0.01$

solving for t for $u \leq 0.01$

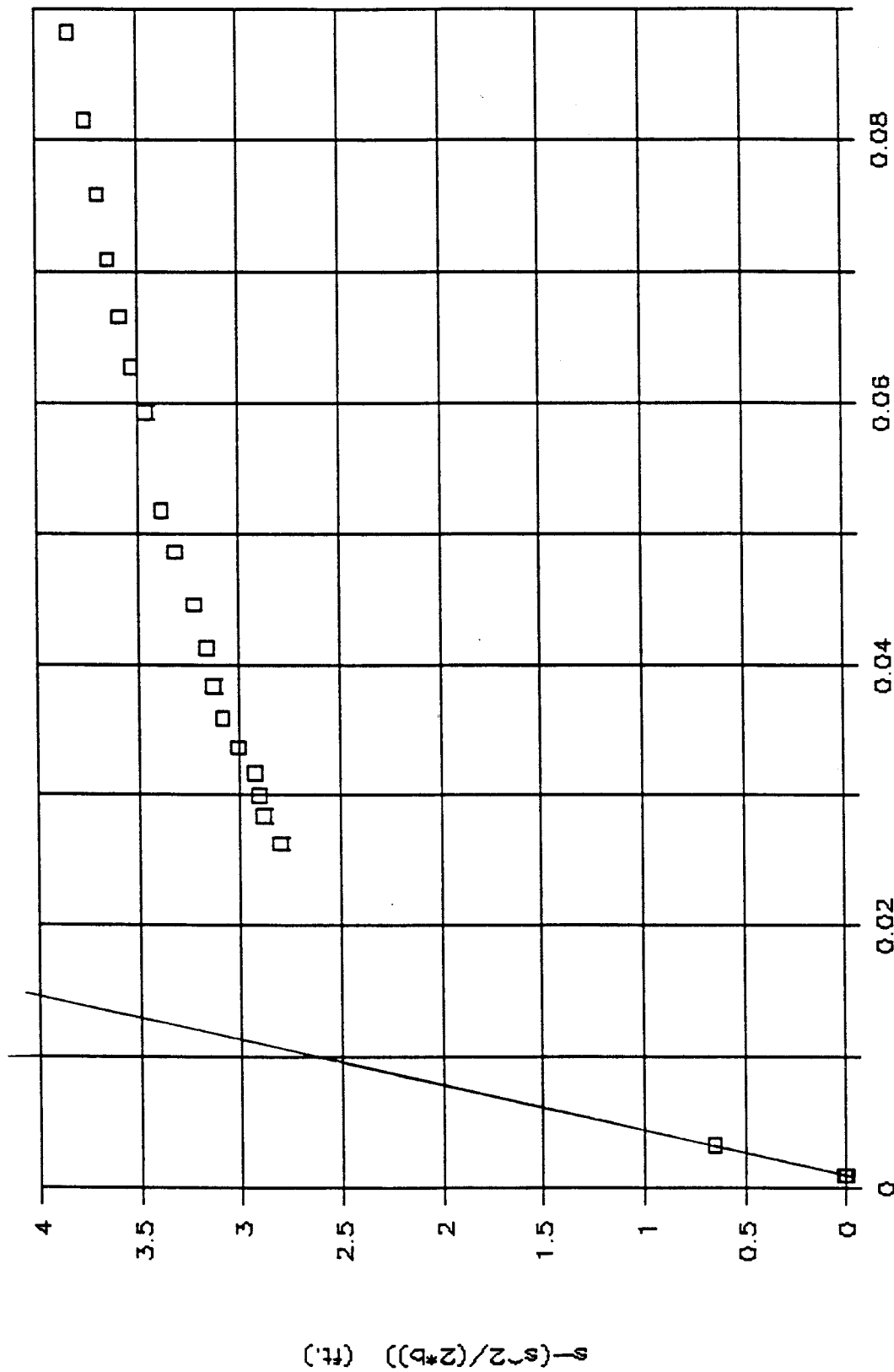
$$t \text{ (min)} = \frac{r^2 S}{4 T u} = \frac{(1.3)^2 \cdot .1}{4 (0.198) (0.01)} \times \frac{1440 \text{ min}}{\text{day}} \times \frac{7.482 \text{ gal}}{\text{ft}^3}$$

$$= 12,243 \text{ min}$$

where $r \text{ (ft)} = \left(\frac{7.25}{24}\right) \text{ ft} = (.30) \text{ ft}$

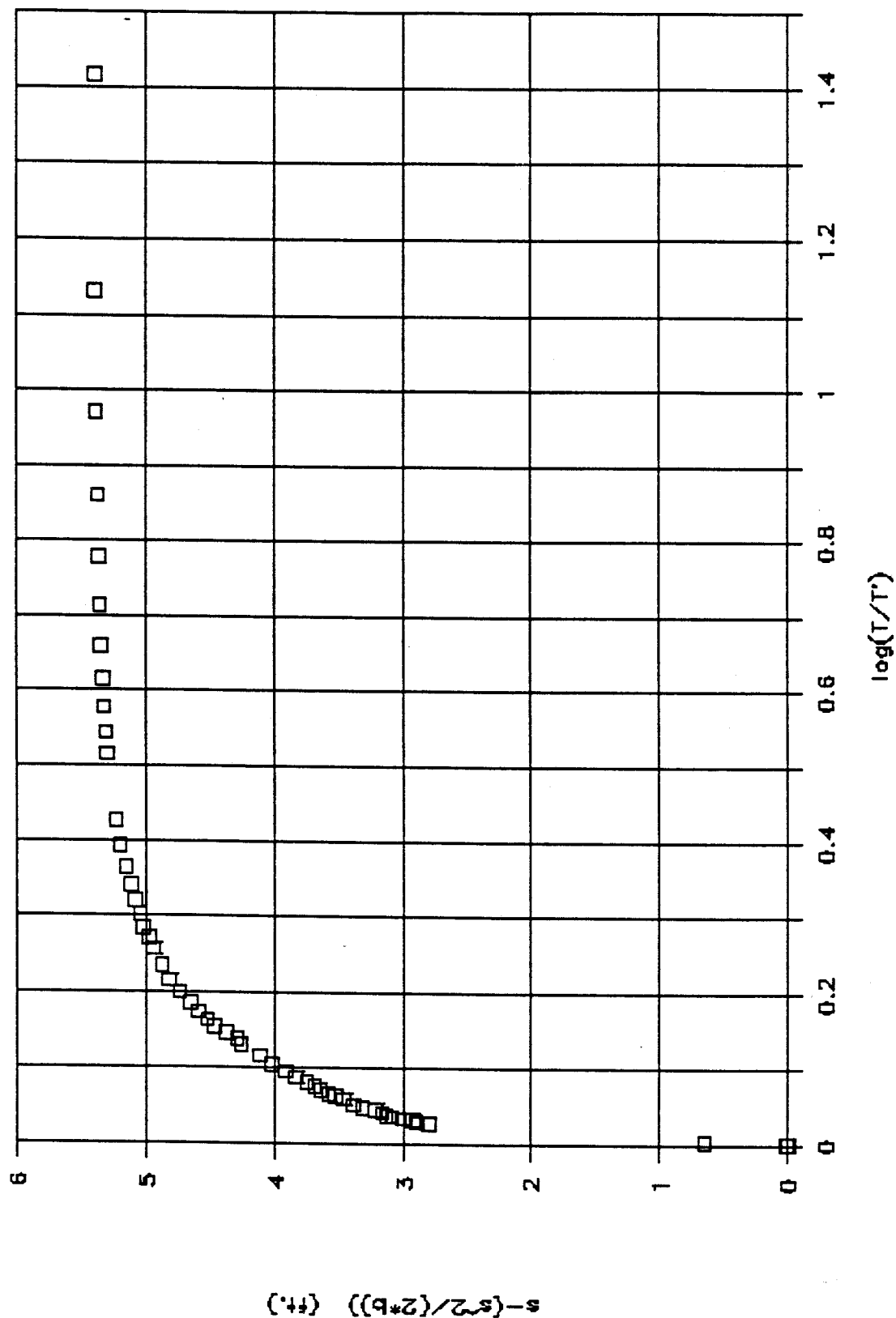
$S = .01$ assumed S for unconfined aquifers.

WELL 30-86

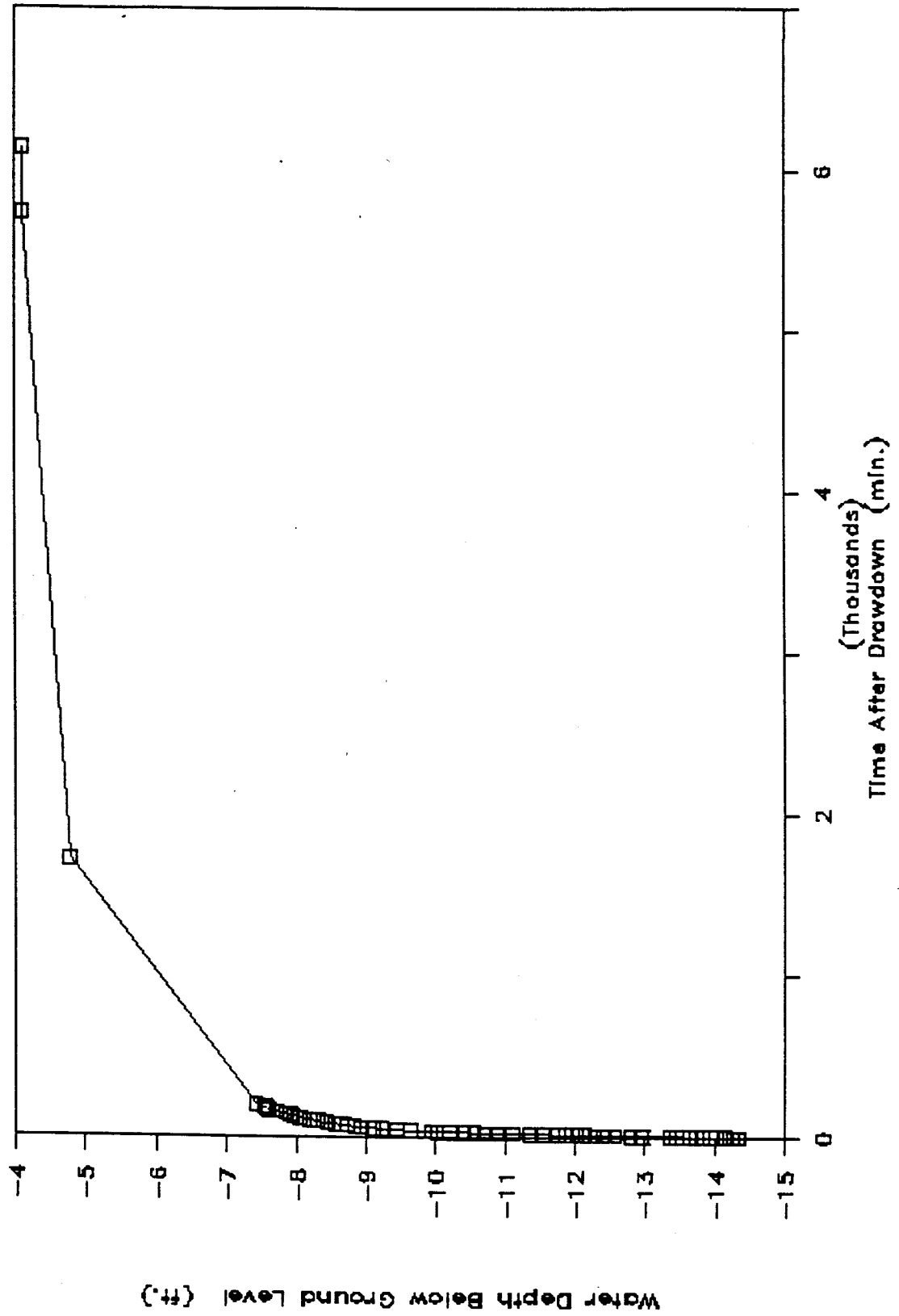


$$\Delta s' = \frac{(4-0)ft}{0.0146 - 0.0010} = 294' / \log_{cycle}$$

WELL 30-86



WELL 30-86



| WELL 30-86 | | | | | |
|---------------------|-------------------------|-------------------------|------------------------|--|--------------|
| T Time (min.) | T' T Prime (min.) | Water Level (ft.) | s Rsd Drwn (ft.) | $s-(s^2/2b)$ $b=10.82$ ft. (ft.) | $\log(T/T')$ |
| 13.00 | 0.50 | 14.34 | 10.23 | 5.39 | 1.41 |
| 13.50 | 1.00 | 14.26 | 10.15 | 5.39 | 1.13 |
| 14.00 | 1.50 | 14.15 | 10.04 | 5.38 | 0.97 |
| 14.50 | 2.00 | 14.01 | 9.90 | 5.37 | 0.86 |
| 15.00 | 2.50 | 13.93 | 9.82 | 5.36 | 0.78 |
| 15.50 | 3.00 | 13.83 | 9.72 | 5.35 | 0.71 |
| 16.00 | 3.50 | 13.73 | 9.62 | 5.34 | 0.66 |
| 16.50 | 4.00 | 13.63 | 9.52 | 5.33 | 0.62 |
| 17.00 | 4.50 | 13.53 | 9.42 | 5.32 | 0.58 |
| 17.50 | 5.00 | 13.44 | 9.33 | 5.31 | 0.54 |
| 18.00 | 5.50 | 13.35 | 9.24 | 5.29 | 0.51 |
| 20.00 | 7.50 | 12.95 | 8.84 | 5.23 | 0.43 |
| 21.00 | 8.50 | 12.79 | 8.68 | 5.20 | 0.39 |
| 22.00 | 9.50 | 12.56 | 8.45 | 5.15 | 0.36 |
| 23.00 | 10.50 | 12.41 | 8.30 | 5.12 | 0.34 |
| 24.00 | 11.50 | 12.28 | 8.17 | 5.09 | 0.32 |
| 25.00 | 12.50 | 12.13 | 8.02 | 5.05 | 0.30 |
| 26.00 | 13.50 | 12.03 | 7.92 | 5.02 | 0.28 |
| 27.00 | 14.50 | 11.87 | 7.76 | 4.98 | 0.27 |
| 28.00 | 15.50 | 11.76 | 7.65 | 4.95 | 0.26 |
| 30.00 | 17.50 | 11.53 | 7.42 | 4.88 | 0.23 |
| 32.00 | 19.50 | 11.36 | 7.25 | 4.82 | 0.22 |
| 34.00 | 21.50 | 11.11 | 7.00 | 4.74 | 0.20 |
| 36.00 | 23.50 | 10.88 | 6.77 | 4.65 | 0.19 |
| 38.00 | 25.50 | 10.72 | 6.61 | 4.59 | 0.17 |
| 40.00 | 27.50 | 10.55 | 6.44 | 4.52 | 0.16 |
| 42.00 | 29.50 | 10.41 | 6.30 | 4.47 | 0.15 |
| 44.00 | 31.50 | 10.20 | 6.09 | 4.38 | 0.15 |
| 46.00 | 33.50 | 10.01 | 5.90 | 4.29 | 0.14 |
| 48.00 | 35.50 | 9.94 | 5.83 | 4.26 | 0.13 |
| 53.00 | 40.50 | 9.64 | 5.53 | 4.12 | 0.12 |
| 58.00 | 45.50 | 9.44 | 5.33 | 4.02 | 0.11 |
| 63.00 | 50.50 | 9.23 | 5.12 | 3.91 | 0.10 |
| 68.00 | 55.50 | 9.09 | 4.98 | 3.83 | 0.09 |
| 73.00 | 60.50 | 8.94 | 4.83 | 3.75 | 0.08 |
| 78.00 | 65.50 | 8.83 | 4.72 | 3.69 | 0.08 |
| 83.00 | 70.50 | 8.74 | 4.63 | 3.64 | 0.07 |
| 88.00 | 75.50 | 8.64 | 4.53 | 3.58 | 0.07 |
| 93.00 | 80.50 | 8.55 | 4.44 | 3.53 | 0.06 |
| 98.00 | 85.50 | 8.44 | 4.33 | 3.46 | 0.06 |
| 111.00 | 98.50 | 8.31 | 4.20 | 3.38 | 0.05 |
| 118.00 | 105.50 | 8.20 | 4.09 | 3.32 | 0.05 |

| WELL 30-86 | | | | | | log(T/T') |
|---------------------|-------------------------|-------------------------|------------------------|------------------------------------|--|-----------|
| T Time (min.) | T' T Prime (min.) | Water Level (ft.) | S Rsd Drwn (ft.) | s-(s^2/2b) b=10.82 ft. (ft.) | | |
| 128.00 | 115.50 | 8.05 | 3.94 | 3.22 | | 0.04 |
| 138.00 | 125.50 | 7.96 | 3.85 | 3.17 | | 0.04 |
| 148.00 | 135.50 | 7.91 | 3.80 | 3.13 | | 0.04 |
| 158.00 | 145.50 | 7.84 | 3.73 | 3.09 | | 0.04 |
| 168.00 | 155.50 | 7.72 | 3.61 | 3.01 | | 0.03 |
| 178.00 | 165.50 | 7.60 | 3.49 | 2.93 | | 0.03 |
| 188.00 | 175.50 | 7.57 | 3.46 | 2.91 | | 0.03 |
| 198.00 | 185.50 | 7.54 | 3.43 | 2.89 | | 0.03 |
| 213.00 | 200.50 | 7.42 | 3.31 | 2.80 | | 0.03 |
| 1725.00 | 1712.50 | 4.78 | 0.67 | 0.65 | | 0.00 |
| 5748.00 | 5735.50 | 4.12 | 0.01 | 0.01 | | 0.00 |
| 6147.00 | 6134.50 | 4.11 | 0.00 | 0.00 | | 0.00 |

AQUIFER TEST DATA

WELL 30-86
PUMPING or OBSERVATION WELL
PUMPING or RECOVERY DATA
PAGE 1 OF 2

TYPE OF AQUIFER TEST Base Down Rec Test
HOW Q MEASURED 4 1/2" BUCKET
HOW W.L.'s MEASURED STAFF
RAD./DIST. OF/FROM PUMPING WELL 1/4"
MEAS. POINT FOR W.L.'s _____
ELEVATION OF MEAS. POINT _____

DEPTH OF PUMP/AIRPIPE _____
PUMP ON: date 11-13-86 time 9:27
PUMP OFF: date 11-13-86 time 9:39:30
DURATION OF AQUIFER TEST _____

| TIME | | | | WATER LEVEL DATA | | | | DISCHARGE | | RECORDED BY | COMMENTS |
|------------|----------|---|-----------|------------------|------------------------|-------------|---------|-----------|---|-------------|----------------|
| CLOCK TIME | | t | at t' = 0 | READING | CONVERSION CORRECTIONS | WATER LEVEL | s or s' | READ-ING | Q | | |
| 1 | 9:40 | | | 15+09 | 1.50 | 14.54 | 10.23 | | | W | |
| | 9:40 1/2 | | | 15+96 | 1.50 | 14.26 | 10.15 | | | W | 9:27 start |
| | 9:41 | | | 15+65 | 1.50 | 14.15 | 10.04 | | | | 9:39:30 finish |
| | 9:41 1/2 | | | 15+61 | | 14.01 | 9.90 | | | | |
| | 9:42 | | | 15+43 | | 13.93 | 9.82 | | | | rec: 2.75 |
| | 9:42 1/2 | | | 15+33 | | 13.83 | 9.72 | | | | 9a |
| | 9:43 | | | 15+23 | | 13.73 | 9.62 | | | | |
| | 43 1/2 | | | 15+13 | | 13.63 | 9.52 | | | | |
| | 44 | | | 15+03 | | 13.53 | 9.42 | | | | |
| | 44 1/2 | | | 10+4.94 | | 13.44 | 9.33 | | | | |
| | 45 | | | 10+4.85 | | 13.35 | 9.24 | | | | 15.34 |
| | 46 | | | 10+4.76 | | | | | | | 5.61 |
| | 47 | | | 10+4.45 | | 12.95 | 8.84 | | | W | 10:23 3 |
| | 48 | | | 10+4.29 | | 12.79 | 8.68 | | | | |
| | 49 | | | 10+4.06 | | 12.56 | 8.45 | | | (READING) | 6.633=96 |
| | 50 | | | 10+3.91 | | 12.41 | 8.30 | | | | |
| | 51 | | | 10+3.78 | | 12.28 | 8.17 | | | | |
| | 52 | | | 10+3.63 | | 12.13 | 8.02 | | | | |
| | 53 | | | 10+3.53 | | 12.03 | 7.92 | | | | |
| | 54 | | | 10+3.37 | | 11.87 | 7.76 | | | | |
| | 9:55 | | | 10+3.26 | | 11.76 | 7.65 | | | | |
| | 9:57 | | | 10+3.03 | | 11.53 | 7.42 | | | | |
| | 9:59 | | | 10+2.86 | | 11.36 | 7.25 | | | | |
| | 10:01 | | | 10+2.61 | | 11.11 | 7.00 | | | | |
| | 10:03 | | | 10+2.38 | | 10.88 | 6.77 | | | | |
| | 10:05 | | | 10+2.22 | | 10.72 | 6.61 | | | | |
| | 10:07 | | | 10+2.05 | | 10.55 | 6.44 | | | | |
| | 10:09 | | | 10+1.91 | | 10.41 | 6.30 | | | | |
| | 10:11 | | | 10+1.70 | | 10.27 | 6.09 | | | | |
| | 10:13 | | | 10+1.51 | | 10.01 | 5.80 | | | | |
| | 10:15 | | | 10+1.44 | | 9.94 | 5.83 | | | | |
| | 10:20 | | | 10+1.14 | | 9.64 | 5.63 | | | | |
| | 10:25 | | | 10+.94 | | 9.44 | 5.33 | | | | |
| | 10:30 | | | 10+.73 | | 9.23 | 5.12 | | | | |
| | 10:35 | | | 10+.59 | | 9.09 | 4.98 | | | | |
| | 10:40 | | | 10+.44 | | 8.94 | 4.83 | | | | |
| | 10:45 | | | 10+.33 | | 8.83 | 4.72 | | | | |
| | 10:50 | | | 10+.24 | | 8.74 | 4.63 | | | | |
| | 10:55 | | | 10+.14 | | 8.64 | 4.53 | | | | |
| | 11:00 | | | 10+.05 | | 8.55 | 4.44 | | | | |
| | 11:05 | | | 10+.94 | | 8.44 | 4.33 | | | | |

ELEVATION OF MEAS. POINT _____

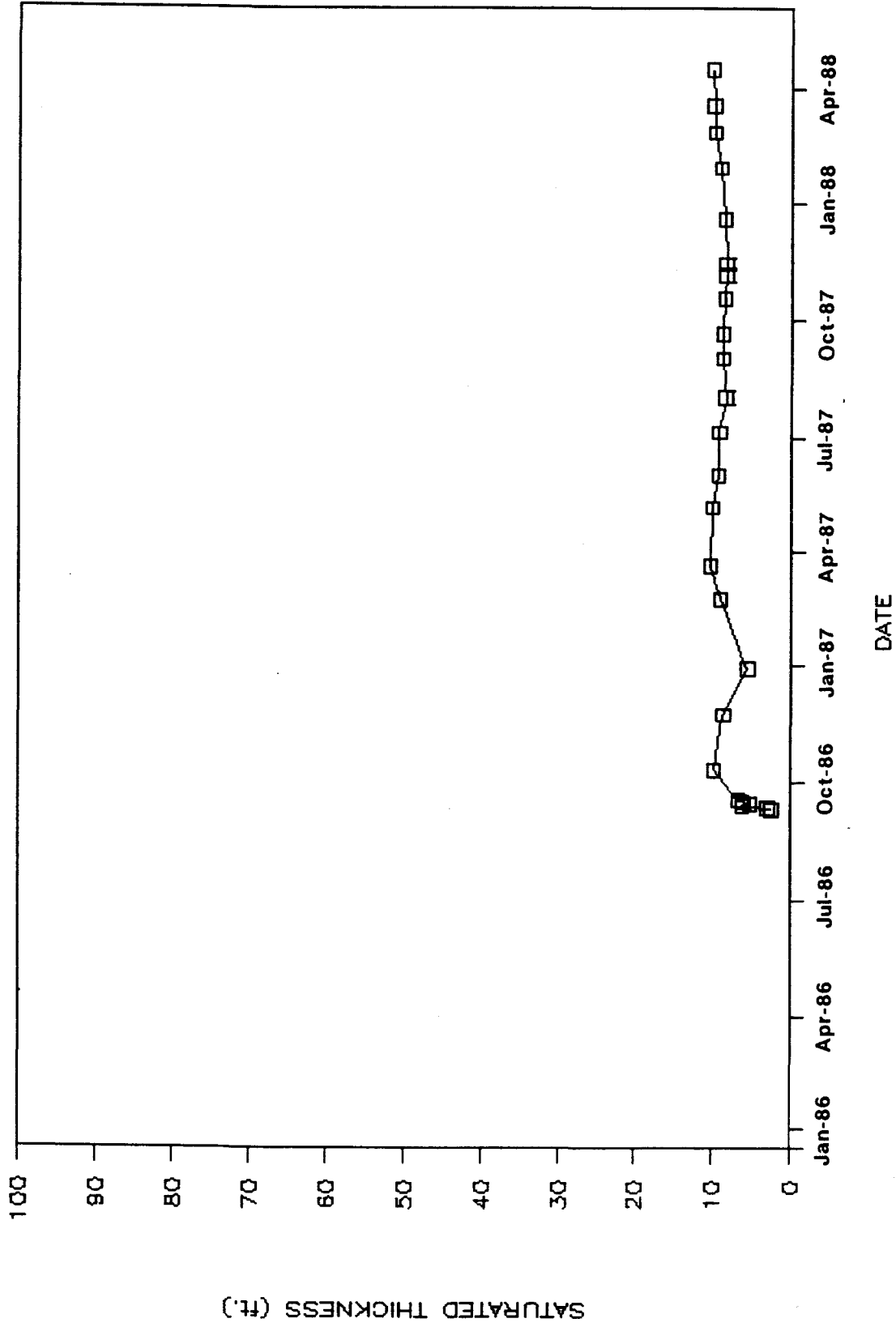
PROJECT

ROCKY FLATS SOLAR PONDS

WATER LEVEL SUMMARY

| WELL NUMBER | DATE | GROUND SURFACE ELEVATION | TOP OF CASING ELEVATION | STICK UP | DEPTH OF SI BASE | WATER DEPTH BELOW TOC | WATER SURFACE ELEVATION |
|----------------|----------|--------------------------------|-------------------------------|-------------|------------------------|-----------------------------|-------------------------------|
| 3086 | 09/12/86 | 5956.21 | 5957.62 | 1.41 | 14.93 | 12.33 | 5945.29 |
| | 09/13/86 | | | | | 11.94 | 5945.68 |
| | 09/15/86 | | | | | 8.67 | 5948.95 |
| | 09/16/86 | | | | | 9.67 | 5947.95 |
| | 09/17/86 | | | | | 8.87 | 5948.75 |
| | 09/18/86 | | | | | 8.66 | 5948.96 |
| | 09/19/86 | | | | | 8.14 | 5949.48 |
| | 10/13/86 | | | | | 5.07 | 5952.55 |
| | 11/26/86 | | | | | 6.21 | 5951.41 |
| | 01/01/87 | | | | | 9.33 | 5948.29 |
| | 02/25/87 | | | | | 5.90 | 5951.72 |
| | 03/23/87 | | | | | 4.58 | 5953.04 |
| | 05/08/87 | | | | | 4.79 | 5952.83 |
| | 06/03/87 | | | | | 5.62 | 5952.00 |
| | 07/08/87 | | | | | 5.70 | 5951.92 |
| | 08/04/87 | | | | | 6.50 | 5951.12 |
| | 09/03/87 | | | | | 6.10 | 5951.52 |
| | 09/23/87 | | | | | 6.10 | 5951.52 |
| | 10/21/87 | | | | | 6.40 | 5951.22 |
| | 11/09/87 | | | | | 6.50 | 5951.12 |
| | 11/17/87 | | | | | 6.50 | 5951.12 |
| | 12/22/87 | | | | | 6.40 | 5951.22 |
| | 02/01/88 | | | | | 5.90 | 5951.72 |
| | 02/29/88 | | | | | 5.10 | 5952.52 |
| | 03/21/88 | | | | | 5.00 | 5952.62 |
| | 04/18/88 | | | | | 4.90 | 5952.72 |

SATURATED THICKNESS IN WELL # 30-86 (SP)



INDEX OF DATA

Boring No.: 31-86

Completed as well? Yes

Data in File

- ☒ Log of Borehole
- ☒ Well Construction Summaries
- ☐ Well Development Summaries
- ☐ Hydraulic Conductivity Test Data and Results
- ☐ Packer Test Data and Results
- ☒ Water Level Data
- ☒ Saturated Thickness Hydrographs

Project: Rocky Flats Plant


LOG OF BORING NO. 31-86

Date Drilled 9/2/86

Coordinates N38066.2 E 21661.8

Boring Method Hollow Stem Auger

Ground Surface Elevation 5964.21'

| Elev. (feet) | Depth (feet) | Sample Type | Graphic Log | Material Description | Penetration Resistance (Blows/Inch) | | Water Content (%) | | Other Tests |
|-----------------|-----------------|----------------|--|---|---|----|-------------------------|----|----------------|
| | | | | | 20 | 40 | 20 | 40 | |
| | 0 | |  | <p>ARTIFICIAL FILL</p> <p>0-2.0'-Sample. Recovered 2.0/2.0'=100%.</p> <p>0-0.9': SILTY GRAVEL: grayish brown (5YR 2/2) very fine-grained sand, silt and gravel; few roots; poorly sorted; angular; unconsolidated; dry.</p> <p>ARAPAHOE FORMATION</p> <p>0.9-2.0': SAND: light gray (N 8/0) to dusky brown (5YR 3/2) medium to fine-grained; some clayey sand; moderately sorted; firm; apparent bedding from variation in clay fraction; alternating layers of sand and clayey sand; dark yellow stain (10YR 6/6) increase in sand and silt percent from 1.5-2.0'; firm; damp.</p> <p>2.0-4.0'-Sample. Recovered 1.2/2.0'=60%.</p> <p>SAND: light gray (N 8/0) to grayish orange (10YR 4/4); medium-grained sand, some clay and silt; dark yellowish orange (10YR 6/6) mottles; calcareous sand from 3.0-3.5'; firm; damp.</p> <p>4.0-7.0'-Sample. Recovered 3.0/3.0'=100%.</p> <p>SAND: grayish orange (10YR 7/4); silty and clayey sand at 4.9 and 6.2'; calcareous fracture at 6.8'; medium to fine-grained; quartz predominates; soft; damp.</p> | | | | | |
| | 5 | | | | | | | | |
| | 10 | | | | | | | | |
| | 15 | | | | | | | | |
| | 20 | | | | | | | | |

Remarks

Logged by: T. Murphy

Checked by: 

Project No.

106P06222

Hydro-Search, Inc.

Page 1 of 3

| | | | | | | | |
|--|--|--|--|--|--|--|--|
| Project: Rocky Flats Plant | | | | LOG OF BORING NO. 31-86 | | | |
| Date Drilled 9/2/86 | | | | Coordinates N 38066.2 E 21661.8 | | | |
| Boring Method Hollow Stem Auger | | | | Ground Surface Elevation 5464.21' | | | |

| Elev. (feet) | Depth (feet) | Sample Type | Graphic Log | Material Description | Penetration Resistance (Blows/Inch) 20 40 | Water Content (%) 20 40 | Other Tests |
|-----------------|-----------------|----------------|----------------|---|--|----------------------------------|----------------|
| | 20 | | | | | | |
| | 25 | | | 7.0-12.0'-Sample. Recovered 5.0/5.0'=100%. SAND: grayish orange (10YR 7/4); medium to fine- grained; moderately clean; some silt; slight color variation to pale olive (10YR 6/2) with depth; soft; damp. | | | |
| | 30 | | | 12.0-17.0'-Sample. Recovered 4.0/5.0'=80%. 12.0-14.9': SAND: pale olive (10YR 6/2) to grayish orange (10YR 7/4); medium to fine-grained; moderately clean; some silt; soft; damp. 14.9-16.5': CLAYSTONE: grayish olive (10Y 9/2); dark yellowish orange (10YR 6/6) mottles; occasional thin sand layers at 14.8 and 15.8'; slightly calcareous; firm; damp. | | | |
| | 35 | | | 16.5-17.0': CLAYSTONE: dark olive gray (5Y 3/2); silty; black wood fragments; firm; damp. | | | |
| | 40 | | | 17.0-22.0'-Sample. Recovered 5.0/5.0'=100%. 17.2-17.7': CLAYSTONE: dark olive gray (5Y 3/2); silty; black wood fragments; firm; damp. 17.7-20.0': SAND: pale olive (10Y 6/2); yellowish orange (10YR 6/6) mottles; some fine-grained sand; occasional sand lenses 0.2' thick; silty; firm; damp. | | | |

| | | |
|----------------|----------------------|--------------------------------|
| Remarks | Logged by: T. Murphy | Checked by: <i>[Signature]</i> |
|----------------|----------------------|--------------------------------|

| | | |
|---------------------------------|---------------------------|-------------|
| Project No. 106P06222 | Hydro-Search, Inc. | Page 2 of 3 |
|---------------------------------|---------------------------|-------------|

Project: Rocky Flats Plant

LOG OF BORING NO. 31-86

Date Drilled 9/2/86

Coordinates N 38066.2 E 21661.8

Boring Method Hollow Stem Auger

Ground Surface Elevation 3964.21'

| Elev. (feet) | Depth (feet) | Sample Type | Graphic Log | Material Description | Penetration Resistance (Blows/Inch) | | Water Content (%) | | Other Tests |
|-----------------|-----------------|----------------|----------------|---|---|----|-------------------------|----|----------------|
| | | | | | 20 | 40 | 20 | 40 | |
| | 40 | | | 20.0-20.9': CLAYSTONE: moderate yellowish brown (10YR 5/4) to dark yellowish orange (10YR 6/6); dark yellowish orange (10YR 6/6) stains; firm; damp. | | | | | |
| | 45 | | | 20.9-22.0': CLAYSTONE: moderate yellowish brown (10YR 5/4) to dark yellowish orange (10YR 6/6); dark yellowish orange (10YR 6/6) stains; iron- stone; firm; damp. | | | | | |
| | | | | TOTAL DEPTH: 22.0' | | | | | |
| | 50 | | | | | | | | |
| | 55 | | | | | | | | |
| | 60 | | | | | | | | |

Remarks Logged by: T. Murphy

Checked by: *[Signature]*

Project No.
106P06222

Hydro-Search, Inc.

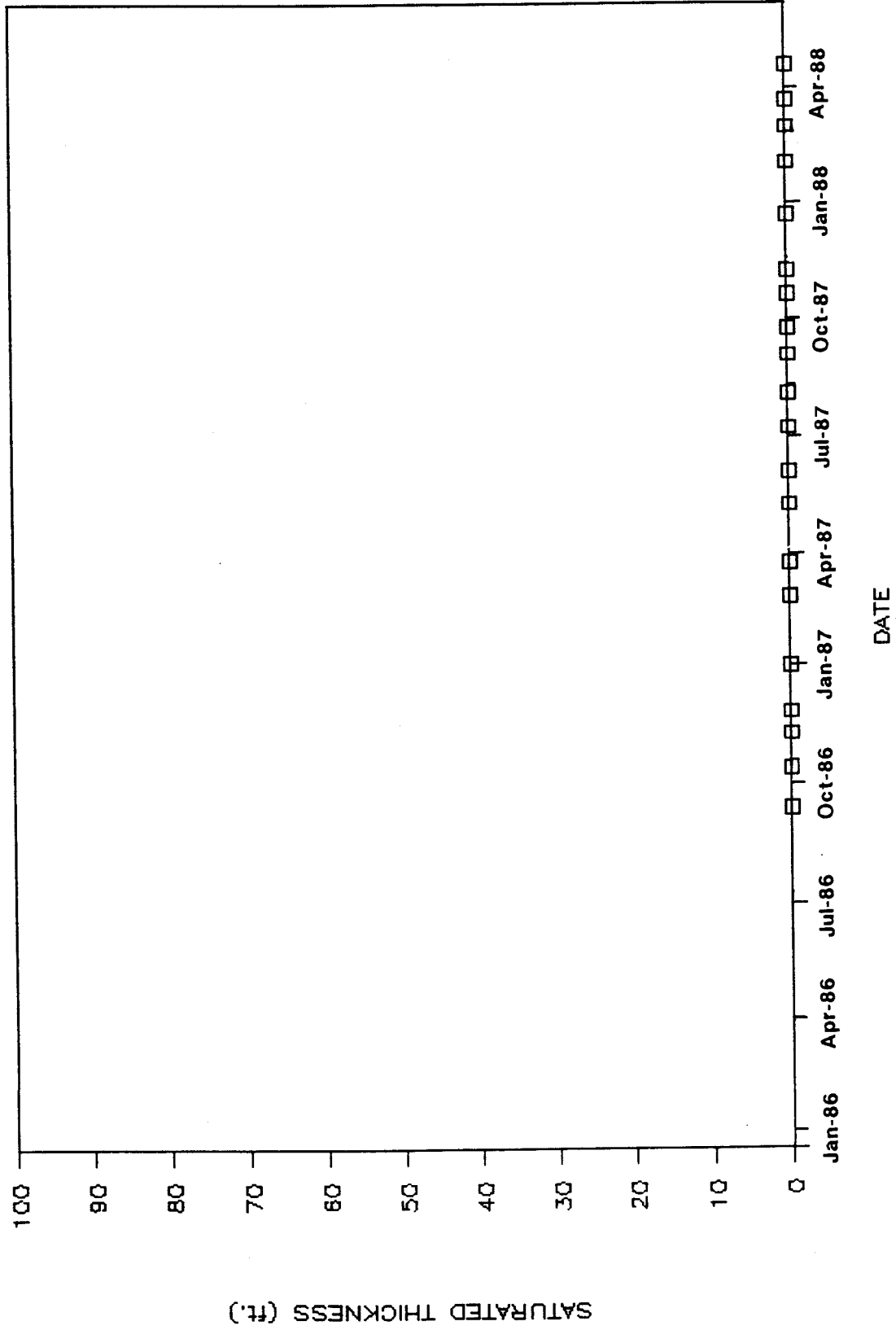
Page 3 of 3

ROCKY FLATS SOLAR PONDS

WATER LEVEL SUMMARY

| WELL NUMBER | DATE | GROUND SURFACE ELEVATION | TOP OF CASING ELEVATION | STICK UP | DEPTH OF SI BASE | WATER DEPTH BELOW TOC | WATER SURFACE ELEVATION |
|----------------|----------|--------------------------------|-------------------------------|-------------|------------------------|-----------------------------|-------------------------------|
| 3186 | 09/12/86 | 5964.21 | 5966.67 | 2.46 | 17.32 | -1.00 | DRY |
| | 10/13/86 | | | | | -1.00 | DRY |
| | 11/09/86 | | | | | -1.00 | DRY |
| | 11/26/86 | | | | | -1.00 | DRY |
| | 01/01/87 | | | | | -1.00 | DRY |
| | 02/25/87 | | | | | -1.00 | DRY |
| | 03/23/87 | | | | | -1.00 | DRY |
| | 05/08/87 | | | | | -1.00 | DRY |
| | 06/03/87 | | | | | -1.00 | DRY |
| | 07/08/87 | | | | | -1.00 | DRY |
| | 08/04/87 | | | | | -1.00 | DRY |
| | 09/03/87 | | | | | -1.00 | DRY |
| | 09/24/87 | | | | | -1.00 | DRY |
| | 10/21/87 | | | | | -1.00 | DRY |
| | 11/09/87 | | | | | -1.00 | DRY |
| | 12/22/87 | | | | | -1.00 | DRY |
| | 02/01/88 | | | | | -1.00 | DRY |
| | 02/29/88 | | | | | -1.00 | DRY |
| | 03/21/88 | | | | | -1.00 | DRY |
| | 04/18/88 | | | | | -1.00 | DRY |

SATURATED THICKNESS IN WELL # 31-86 (SP)



INDEX OF DATA

Boring No.: 32-86

Completed as well? Yes

Data in File

- X Log of Borehole
- X Well Construction Summaries
- Well Development Summaries
- X Hydraulic Conductivity Test Data
and Results
- X Packer Test Data and Results
- X Water Level Data
- X Saturated Thickness Hydrographs

Project: Rocky Flats Plant

LOG OF BORING NO. 32-86

Date Drilled 9/3/86, 9/22/86-9/25/86

Coordinates N 38065.7 E 21640.7

Boring Method Hollow Stem Auger/NC Core

Ground Surface Elevation 5964.46'

| Elev. (feet) | Depth (feet) | Sample Type | Graphic Log | Material Description | Penetration Resistance (Blows/inch) | | Water Content (%) | | Other Tests |
|-----------------|-----------------|----------------|----------------|--|---|----|-------------------------|----|----------------|
| | | | | | 20 | 40 | 20 | 40 | |
| | 0 | | | ARTIFICIAL FILL | | | | | |
| | | | | 0-2.0'-Sample. Recovered 2.0/2.0'=100%. | | | | | |
| | | | | 0-0.8': TOP SOIL: dark yellowish brown (10YR 4/2); unconsolidated; dry. | | | | | |
| | | | | ARAPAHOE FORMATION | | | | | |
| | 5 | | | 0.8-2.0': SANDSTONE: light gray (N 7); medium to fine- grained; mostly fine- grained sand and silt; slightly calcareous; massive; no apparent bedding; well sorted; firm; dry. | | | | | |
| | | | | 2.0-4.0'-Sample. Recovered 2.0/2.0'=100%. | | | | | |
| | 10 | | | SANDSTONE: light gray (N 7); dark yellowish orange (10YR 6/6) stains; increase in silt content; soft; well sorted; dry. | | | | | |
| | | | | 4.0-7.0'-Sample. Recovered 3.0/3.0'=100%. | | | | | |
| | 15 | | | SANDSTONE: light gray (N 7) with dark yellowish orange (10YR 6/6) mottling; increased clay and silt at 4.8' to 6.3'; bedding 0.05' thick; apparent bedding from variations in staining; leaf imprints; very slightly calcareous along fractures; soft; damp. | | | | | |
| | | | | 7.0-12.0'-Sample. Recovered 5.0/5.0'=100%. | | | | | |
| | 20 | | | SANDSTONE: medium light gray (N 6) to medium dark gray (N 4); fine to very fine-grained; silty with some clay; dark yellowish orange (10YR 6/6) stains; clayey sand layers alternate with sand layers 0.5-0.8' thick; soft; damp. | | | | | |

Remarks Logged by: T. Murphy & J. Bergman

Checked by: *[Signature]*

Project No.
106P06222

Hydro-Search, Inc.

Page 1 of 7

Project: Rocky Flats Plant

LOG OF BORING NO. 32-86

Date Drilled 9/3/86, 9/22/86-9/25/86

Coordinates N 38065.7 E 21640.7


Boring Method Hollow Stem Auger/NC Core

Ground Surface Elevation 5964.46'

| Elev. (feet) | Depth (feet) | Sample Type | Graphic Log | Material Description | Penetration Resistance (Blows/Inch) | | Water Content (%) | | Other Tests |
|-----------------|-----------------|----------------|----------------|--|---|----|-------------------------|----|----------------|
| | | | | | 20 | 40 | 20 | 40 | |
| | 20 | | | 12.0-17.0'-Sample. Recovered 5.0/5.0'=100%. 12.0-16.5': SANDSTONE: medium light gray (N 6) to medium dark gray (N 4); fine to very fine-grained; silty with some clay; dark yellowish orange (10YR 6/6) stains; soft; damp. 16.5-17.0': CLAYSTONE: medium gray (N 5) to dark gray (N 2) and pale olive (10YR 6/2); black wood fragments; amount of clay and thickness of beds increase with depth; firm; damp. | | | | | |
| | 25 | | | 17.0-22.0'-Sample. Recovered 5.0/5.0'=100%. CLAYSTONE: grayish olive (10Y 4/2) to medium gray (N 5); dark yellowish orange (10YR 6/6) mottles; calcareous thin sand lenses at 18.0 and 18.5'; lenses are 0.01-0.02' thick; firm; damp. | | | | | |
| | 30 | | | 22.0-27.0'-Sample. Recovered 5.0/5.0'=100%. CLAYSTONE: grayish olive (10Y 4/2) to medium gray (N 5); dark yellowish orange (10YR 6/6) mottles; firm; damp. | | | | | |
| | 35 | | | 25.0-31.0'-Sample. Recovered 0.0/6.0'=0%. 31.0-36.0'-Sample. Recovered 2.8/5.0'=56%. RQD=1.7/2.8'=12%. CLAYSTONE: pale yellowish brown (10YR 6/2) clay and silty clay; abundant moderate yellowish brown (10YR 5/4) mottles; very well sorted; few organics; consolidated; damp. | | | | | |
| | 40 | | | 36.0-41.5'-Sample. Recovered 0.0/5.5'=0%. | | | | | |

Remarks

Logged by: T. Murphy & J. Bergman

Checked by: 

Project No.

106P06222

Hydro-Search, Inc.

Page 2 of 7

Project: Rocky Flats Plant

LOG OF BORING NO. 32-86

Date Drilled 9/3/86, 9/22/86 - 9/25/86

Coordinates N 38065.7 E 21640.7

Boring Method Hollow Stem Auger/NC Core

Ground Surface Elevation 3964.46'

| Elev. (feet) | Depth (feet) | Sample Type | Graphic Log | Material Description | Penetration Resistance (Blows/inch) | | Water Content (%) | | Other Tests |
|-----------------|-----------------|----------------|----------------|---|---|----|-------------------------|----|----------------|
| | | | | | 20 | 40 | 20 | 40 | |
| | 40 | | | 41.5-47.0'-Sample. Recovered 2.0/5.5'=36%. RQD=0.3/2.0'=17%. CLAYSTONE: olive gray (5Y 3/2); abundant dark yellowish orange (10YR 6/6) limonite stains predominantly along vertical fractures; consolidated; very well sorted; moist. | | | | | |
| | 45 | | | 47.0-52.0'-Sample. Recovered 3.7/5.0'=74%. RQD=2.0/3.7'=54%. CLAYSTONE: light olive gray (5Y 5/2); abundant dark yellowish orange (10YR 6/6) and dusky red (5R 3/2) iron staining along fractures; some organics; very well sorted; consolidated; moist. | | | | | |
| | 50 | | | 52.0-57.0'-Sample. Recovered 4.0/5.0'=80%. RQD=3.5/4.0'=88%. CLAYSTONE: olive gray (5Y 3/2); abundant dark yellowish orange (10YR 6/6) stains; few dusky red (5R 3/2) stains; few organics; very well sorted; consolidated; slightly damp. | | | | | |
| | 55 | | | 57.0-62.0'-Sample. Recovered 4.3/5.0'=86%. RQD= 3.2/4.3'=75%. CLAYSTONE: olive gray (5Y 3/2); some black organic fragments; few wood fragments; some moderate yellowish brown siltstone; very well sorted; consolidated; firm; damp. | | | | | |
| | 60 | | | | | | | | |

Remarks

Logged by: T. Murphy & J. Bergman

Checked by: 

Project No.

106P06222

Hydro-Search, Inc.

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Project: Rocky Flats Plant

LOG OF BORING NO. 32-86

Date Drilled 9/3/86, 9/22/86 - 9/25/86

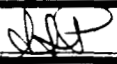
Coordinates N 38065.7 E 21640.7

Boring Method Hollow Stem Auger/NC Core

Ground Surface Elevation 5964.46'

| Elev. (feet) | Depth (feet) | Sample Type | Graphic Log | Material Description | Penetration Resistance (Blows/Inch) | | Water Content (%) | | Other Tests |
|-----------------|-----------------|----------------|----------------|---|---|----|-------------------------|----|----------------|
| | | | | | 20 | 40 | 20 | 40 | |
| | 60 | | | 62.0-67.0'-Sample. Recovered 5.0/5.0'=100%. RQD=4.0/5.0'=80%. CLAYSTONE: olive gray (5Y 3/2); few yellowish orange mottles (10YR 5/4); no organics; very well sorted; consolidated; damp. | | | | | |
| | 65 | | | 67.0-72.0'-Sample. Recovered 0.6/5.0'=12%. RQD=0.0/0.6'=0%. CLAYSTONE: olive gray (5Y 3/2); few moderate yellowish brown (10YR 5/4) mottles; well sorted; consolidated; no organics; homogenous; damp. | | | | | |
| | 70 | | | 72.0-77.0'-Sample. Recovered 2.5/5.0'=50%. RQD=0.6/2.5'=24%. CLAYSTONE: olive gray (5Y 3/2); very well sorted; consolidated; homogenous; several black organic fragments; slightly damp. | | | | | |
| | 75 | | | 78.0-83.0'-Sample. Recovered 3.0/5.0'=60%. RQD=2.2/3.0'=73%. CLAYSTONE: olive gray (5Y 3/2); moderate yellowish brown (10YR 5/4) siltstone nodules; well sorted; consolidated; homogenous; no organics; moist. | | | | | |
| | 80 | | | | | | | | |

Remarks Logged by: T. Murphy & J. Bergman

Checked by: Project No.
106P06222

Hydro-Search, Inc.

Page 4 of 7

| | | | | | | | |
|--|--|--|--|--|--|--|--|
| Project: Rocky Flats Plant | | | | LOG OF BORING NO. 32-86 | | | |
| Date Drilled 9/3/86, 9/22/86 - 9/25/86 | | | | Coordinates N 38065.7 E 21640.7 | | | |
| Boring Method Hollow Stem Auger/NK Core | | | | Ground Surface Elevation 5964.46' | | | |

| Elev. (feet) | Depth (feet) | Sample Type | Graphic Log | Material Description | Penetration Resistance (Blows/Inch) 20 40 | Water Content (%) 20 40 | Other Tests |
|-----------------|-----------------|-------------|-------------|--|---|-------------------------------|-------------|
| | 80 | | | 83.0-87.0'-Sample. Recovered 3.0/4.0'=75%. RQD=1.4/3.0'=47%. CLAYSTONE: olive gray (5Y 3/2); common moderate yellowish brown (10YR 5/4) mottles and siltstone nodules; well sorted; consolidated; homogenous; moist. | | | |
| | 85 | | | 87.0-92.0'-Sample. Recovered 3.8/5.0'=76%. RQD=0.0/3.8'=0%. CLAYSTONE: olive gray (5Y 3/2); interbedded gray (N 7) sandy and silty clay; very fine-grained; well sorted; consolidated; nicely laminated 0.7'thick; moist. | | | |
| | 90 | | | 92.0-97.0'-Sample. Recovered. 2/5.0'=64%. RQD=2.9/3.2'=91%. SILTY SANDSTONE: light gray (N 7) interbedded with olive gray (5Y 3/2) silty clay; very fine-grained; very well sorted; rounded; consolidated; dry. | | | |
| | 95 | | | 97.0-103.0'-Sample. Recovered 3.6/6.0'=60%. RQD=1.3/3.6'=36%. CLAYSTONE: olive gray (5Y 3/2) clay and silty clay; very fine-grained; little sand; few moderate yellowish brown mottles (10YR 5/4); very well sorted; consolidated; slightly damp. | | | |
| | 100 | | | | | | |

| | | |
|----------------|-----------------------------------|--------------------------------|
| Remarks | Logged by: T. Murphy & J. Bergman | Checked by: <i>[Signature]</i> |
|----------------|-----------------------------------|--------------------------------|

| | | |
|---------------------------------|---------------------------|-------------|
| Project No. 106P06222 | Hydro-Search, Inc. | Page 5 of 7 |
|---------------------------------|---------------------------|-------------|

Project: Rocky Flats Plant

LOG OF BORING NO. 32-86

Date Drilled 9/3/86, 9/22/86 - 9/25/86

Coordinates N 38065.7 E 21640.7

Boring Method Hollow Stem Auger/NC Core

Ground Surface Elevation 5964.46'

| Elev. (feet) | Depth (feet) | Sample Type | Graphic Log | Material Description | Penetration Resistance (Blows/Inch) | | Water Content (%) | | Other Tests |
|-----------------|-----------------|----------------|----------------|--|---|----|-------------------------|----|----------------|
| | | | | | 20 | 40 | 20 | 40 | |
| | 100 | | | 103.0-107.0'-Sample. Recovered 2.3/4.0'=58%. RQD=0.0/2.3'=0%. CLAYSTONE: olive gray (5Y 3/2) clay and silty clay; some very fine-grained sand; very well sorted; rounded; slightly damp. | | | | | |
| | 105 | | | 107.0-112.0'-Sample. Recovered 2.3/5.0'=46%. RQD=1.1/2.3'=48%. CLAYSTONE: olive gray (5Y 3/2) clay and silty clay; very well sorted; consolidated; slightly damp. | | | | | |
| | 110 | | | 112.0-117.0'-Sample. Recovered 4.2/5.0'=83%. RQD=2.8/4.2'=67%. 112.8-115.2': CLAYSTONE: olive gray (5Y 3/2) clay and silty clay; abundant yellowish brown (10YR 5/4) pebble and gravel-sized nodules; angular; moderately sorted; dry. 115.2-117': SAND: light gray (N 7/0); very fine-grained; gradational contact; very well sorted; rounded; consolidated; dry. | | | | | |
| | 115 | | | 117.0-122.0'-Sample. Recovered 2.2/5.0'=44%. RQD=0.5/2.2'=23%. SAND: light gray (N 7/0); very fine-grained and silty sand; very well sorted; rounded; consolidated; lower 1.0' becomes laminated with alternating layers of olive gray (5Y 3/2) clay and gray (N 7) very fine-grained sand; dry. | | | | | |
| | 120 | | | | | | | | |

Remarks

Logged by: T. Murphy & J. Bergman

Checked by: *[Signature]*Project No.
106P06222

Hydro-Search, Inc.

Page 6 of 7

| | | | | | | | |
|--|--|--|--|--|--|--|--|
| Project: Rocky Flats Plant | | | | LOG OF BORING NO. 32-86 | | | |
| Date Drilled 9/3/86, 9/22/86 - 9/25/86 | | | | Coordinates N 38065.7 E 21640.7 | | | |
| Boring Method Hollow Stem Auger/NC Core | | | | Ground Surface Elevation 5964.46' | | | |

| Elev. (feet) | Depth (feet) | Sample Type | Graphic Log | Material Description | Penetration Resistance (Blows/Inch) 20 40 | Water Content (%) 20 40 | Other Tests |
|-----------------|-----------------|-------------|-------------|---|---|---------------------------------|-------------|
| | 120 | | | 122.0-127.0'-Sample. Recovered 4.2/5.0'=84%. RQD=4.0/4.2'=95%. SILTY SAND: light gray (N 7/0); fine and very fine-grained sand and silty sand; thinly laminated with alternating layers of olive gray (5Y 3/2) clay and light gray (N 7) sand; well sorted; consolidated; rounded; dry. | | | |
| | 125 | | | 127.0-132.0'-Sample. Recovered 2.0/5.0'=40%. RQD=0.8/2.0'=40%. CLAYSTONE: olive gray (5Y 3/2) clay and silty clay; one moderate yellowish brown (10YR 5/4) siltstone layer at 131.0' 0.02'wide; very well sorted; consolidated; rounded; dry. | | | |
| | 130 | | | 132.0-135.0'-Sample. Recovered 1.5/3.0'=50%. RQD=0.0/3.0'=0%. CLAYSTONE: olive gray (5Y 3/2); no mottles; well sorted; consolidated; homogenous; dry. | | | |
| | 135 | | | TOTAL DEPTH: 135.0' | | | |
| | 140 | | | | | | |

| | | |
|----------------|-----------------------------------|--------------------------------|
| Remarks | Logged by: T. Murphy & J. Bergman | Checked by: <i>[Signature]</i> |
|----------------|-----------------------------------|--------------------------------|

| | | |
|---------------------------------|---------------------------|-------------|
| Project No. 106P06222 | Hydro-Search, Inc. | Page 7 of 7 |
|---------------------------------|---------------------------|-------------|

WELL CONSTRUCTION SUMMARY

LOCATION or COORDS: _____
 N 38065.7 E 21640.7

ELEVATION: GROUND LEVEL 5964.46'
 TOP OF CASING 5966.96'

DRILLING SUMMARY:

TOTAL DEPTH Well: 125.50' Hole: 135.00'
 BOREHOLE DIAMETER 0.00' - 27.00': 7 1/2"
 27.00' - 135.00': 5 5/8"
 DRILLER Boyles Brothers Drilling Co.
 15865 W. 5th Avenue, Golden, CO
 (Dave Jarvie, Robert Roach)
 RIG 0.00'-27.00' Mobile B-57; 27.00'-135.00'
 BIT(S) 0.00' - 27.00': T-5
 27.00' - 135.00': Carbide bit
 DRILLING FLUID 0.00' - 27.00': None
 27.00' - 135.00': air/water mist
 SURFACE CASING 5" x 30.50' steel w/ lock-
 ing cap

WELL DESIGN:

BASIS: GEOLOGIC LOG X GEOPHYSICAL LOG _____
 CASING STRING(S): C=CASING S=SCREEN
 0.00' 27.00' C1 _____
 0.00' 114.90' C2 _____
 114.90' 125.50' S1 _____

CASING: C1 5" I.D. steel surface casing
 C2 2" I.D. Sch. 5 type 316 stain-
 less steel, threaded and flush
 jointed.

SCREEN: S1 2" I.D. Sch. 5 type 316 stain-
 less steel, threaded and flush
 jointed, 0.010" wire wrap screen,
 0.25' welded bottom cap.

CENTRALIZERS None

FILTER MATERIAL 32-42 silica sand
 112.00' - 114.00'

CEMENT Portland Type I
 0.00' - 112.00'

OTHER 3/8" bentonite pellets
 112.00' - 114.00'
 126.00' - 135.00'

CONSTRUCTION TIME LOG:

| TASK | START | | FINISH | |
|--------------------|-------|------|--------|------|
| | DATE | TIME | DATE | TIME |
| DRILLING: | 1986 | | 1986 | |
| 7 1/2" auger | 9/3 | 1030 | 9/3 | 1210 |
| NC core | 9/23 | 1600 | 9/25 | 1515 |
| Reaming | 9/27 | 1000 | 9/27 | 1200 |
| GEOPHYS. LOGGING: | — | — | — | — |
| CASING: | | | | |
| 5" steel | 9/3 | 1445 | 9/3 | 1505 |
| 2" stainless | 9/29 | 0920 | 9/29 | 0950 |
| FILTER PLACEMENT: | 9/29 | 1055 | 9/29 | 1415 |
| CEMENTING: | 9/29 | 1530 | 9/29 | 1630 |
| DEVELOPMENT: | 10/14 | 1430 | 11/7 | 0945 |
| OTHER: | | | | |
| Bentonite | 9/29 | 1415 | 9/29 | 1445 |
| | 9/27 | 1305 | 9/27 | 1310 |
| Packer testing | 9/25 | 1330 | 9/27 | 0940 |
| Cementing 5" steel | 9/3 | 1506 | 9/3 | 1530 |

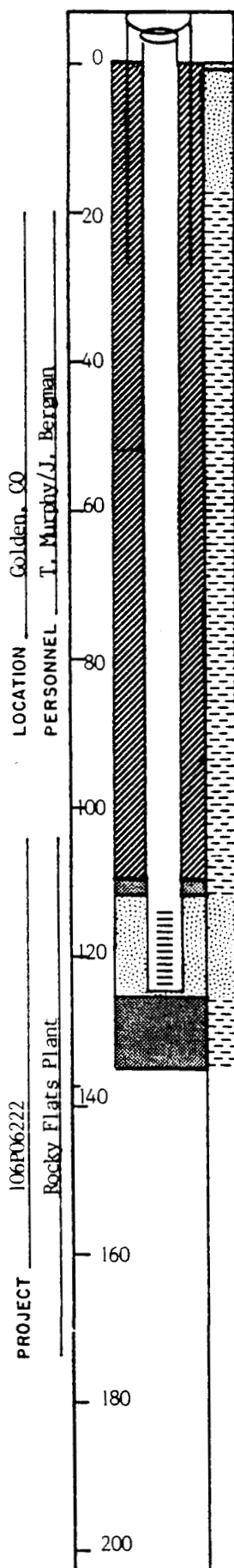
WELL DEVELOPMENT

See Well Development Summary Sheet.

COMMENTS:

No water encountered during drilling.

Top of stainless steel casing: 2.50'



LOCATION Golden, CO

PERSONNEL T. Murphy/J. Bergman

106P06222

Rocky Flats Plant

PROJECT



SHEET _____ of _____

CLIENT/SUBJECT _____ W.O. NO. _____

TASK DESCRIPTION _____ TASK NO. _____

| | | | |
|----------------------|------------|------------|-----------------------|
| PREPARED BY _____ | DEPT _____ | DATE _____ | APPROVED BY _____ |
| MATH CHECK BY _____ | DEPT _____ | DATE _____ | |
| METHOD REV. BY _____ | DEPT _____ | DATE _____ | DEPT _____ DATE _____ |

WELL 32-86

Hydraulic Conductivity (cm/sec) = 9×10^{-8} Flowrate (gpm) = 5.81×10^{-2} gpm

Screened Interval (ft below G.L.) = 114.90' - 125.50'

114.90 - 115.20' claystone

115.2 - 125.50' silty sandstone

Method of Analysis: Residual-Drawdown Plot

(Driscoll, 1986 - pg 256.)

CLIENT/SUBJECT _____ W.O. NO. _____

TASK DESCRIPTION _____ TASK NO. _____

PREPARED BY _____ DEPT _____ DATE _____

MATH CHECK BY _____ DEPT _____ DATE _____

METHOD REV. BY _____ DEPT _____ DATE _____

| | |
|-------------|------------|
| APPROVED BY | |
| | |
| DEPT _____ | DATE _____ |

WELL 32-86

$$T \text{ (gpd/ft)} = \frac{264 Q}{\Delta S'} = \frac{264 (5.81 \times 10^{-2})}{778} = 1.97 \times 10^{-2}$$

where $Q \text{ (gpm)} = 3.75 \text{ gal} / 64.5 \text{ min} = 5.81 \times 10^{-2} \text{ gpm}$

$\Delta S' = \text{ft. change in residual drawdown / log cycle}$
 $= 778 \text{ ft} / \log \text{ cycle (see attached plot)}$

$$K \text{ (gpd/ft}^2\text{)} = T / b = \frac{1.97 \times 10^{-2}}{10.6} = 1.86 \times 10^{-3}$$

where $b \text{ (ft)} = 10.6 \text{ ft}$

$$K \text{ (cm/sec)} = 1.86 \times 10^{-3} \text{ gpd/ft}^2 \times \frac{4.72 \times 10^{-5} \text{ cm/sec}}{\text{gpd/ft}^2} = 9 \times 10^{-8}$$

This method is valid where $u \leq 0.01$

solving for t for $u \leq 0.01$.

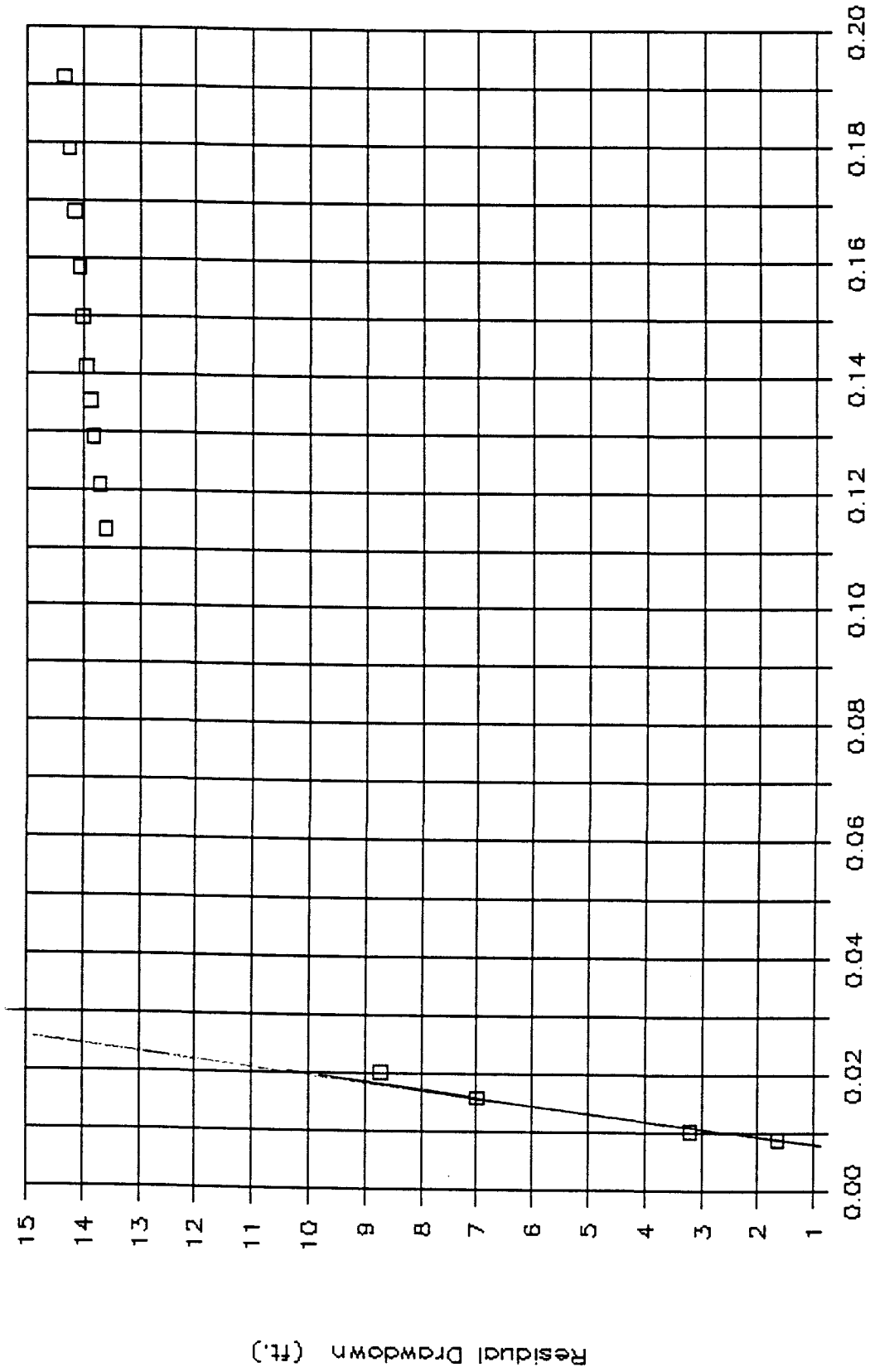
$$t \text{ (min)} = \frac{r^2 S}{4 T u} = \frac{(0.234)^2 (10^{-3})}{(4) (1.97 \times 10^{-2}) (0.01)} \times \frac{1440 \text{ min}}{\text{day}} \times \frac{7.482 \text{ gal}}{\text{ft}^3}$$

$= 749 \text{ min.}$

where $r \text{ (ft)} = \left(\frac{5 \frac{5}{8}}{24} \right) \text{ ft} = 0.234 \text{ ft}$

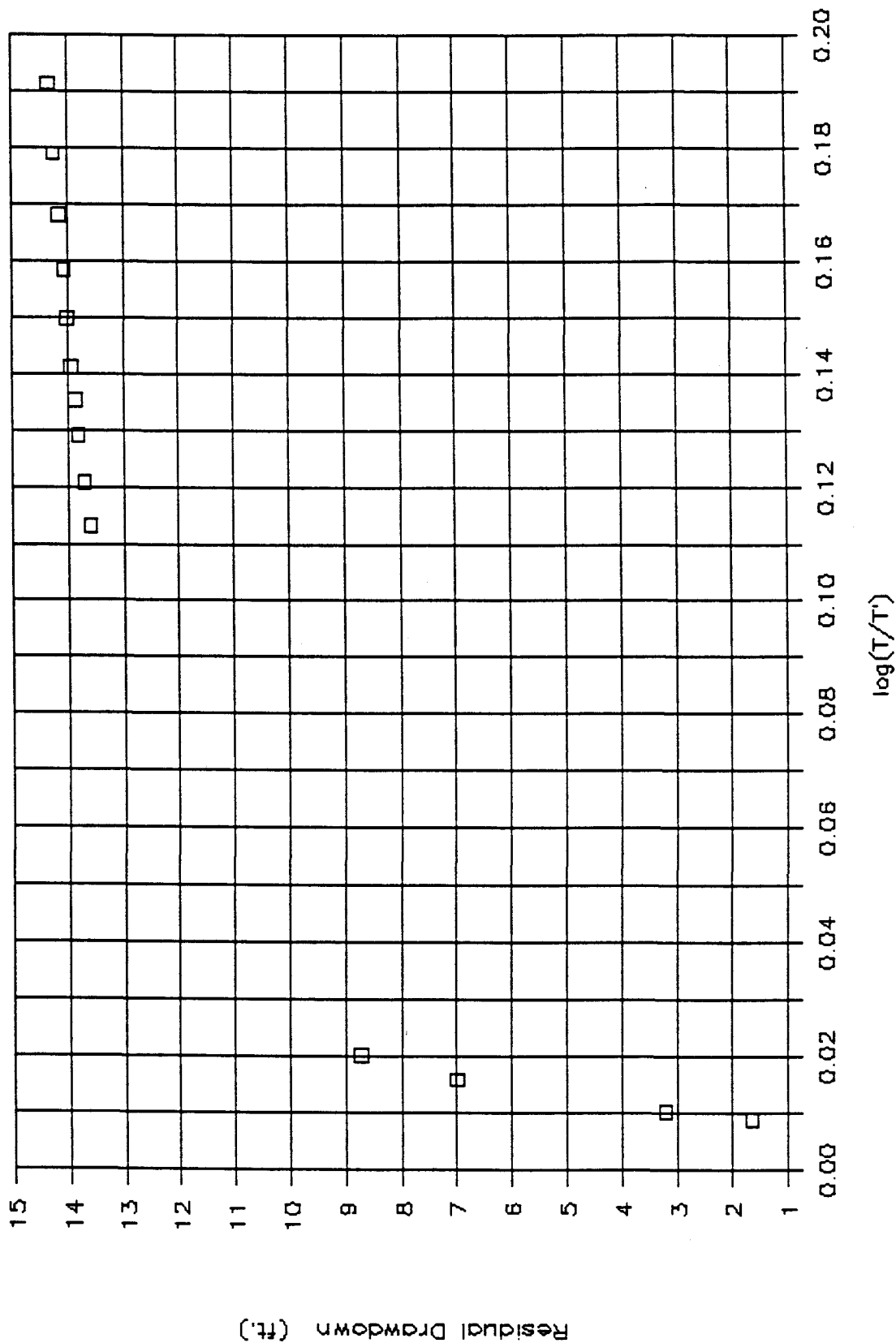
$S = 10^{-3}$ assumed S for confined aquifer
 $\Delta S'$ was used on plots based on $t \geq 1425 \text{ min.}$

WELL 32-86

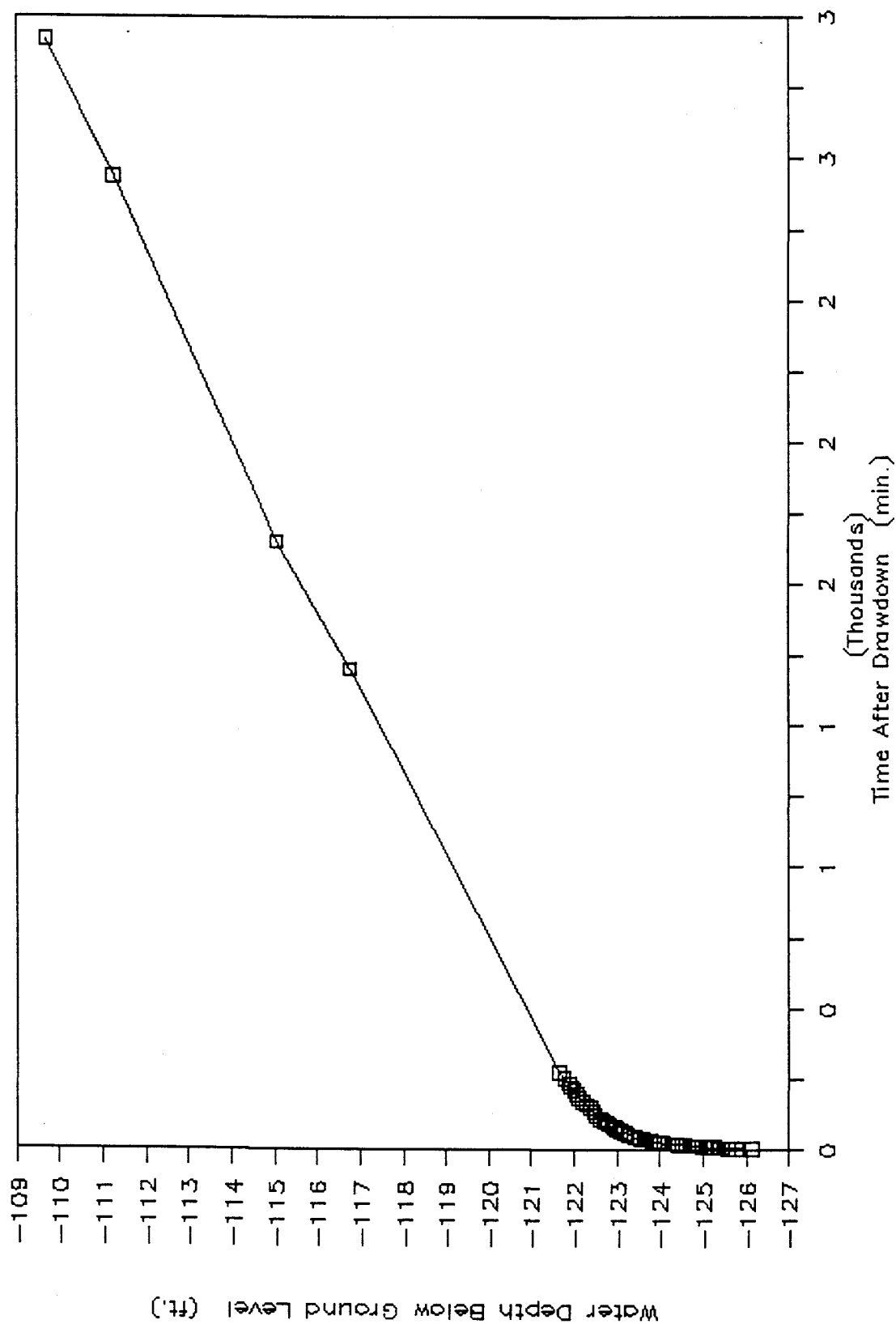


$$\Delta S' = \frac{(15 - 1) \text{ ft}}{0.026 - 0.008} = 778 \text{ ft/log cycle}$$

WELL 32-86



WELL 32-86



| WELL 32-86 | | | | |
|----------------|-------------------|----------------|-------------------|-----------|
| T | T' | Water | s' | log(T/T') |
| Time (min.) | T Prime (min.) | Level (ft.) | Rsd Drwn (ft.) | |
| 66.00 | 1.50 | 126.13 | 18.08 | 1.64 |
| 67.00 | 2.50 | 125.75 | 17.70 | 1.43 |
| 67.50 | 3.00 | 125.60 | 17.55 | 1.35 |
| 68.00 | 3.50 | 125.58 | 17.53 | 1.29 |
| 68.50 | 4.00 | 125.56 | 17.51 | 1.23 |
| 69.00 | 4.50 | 125.46 | 17.41 | 1.19 |
| 69.50 | 5.00 | 125.36 | 17.31 | 1.14 |
| 70.00 | 5.50 | 125.35 | 17.30 | 1.10 |
| 70.50 | 6.00 | 125.25 | 17.20 | 1.07 |
| 71.00 | 6.50 | 125.20 | 17.15 | 1.04 |
| 72.00 | 7.50 | 125.08 | 17.03 | 0.98 |
| 73.00 | 8.50 | 124.96 | 16.91 | 0.93 |
| 74.00 | 9.50 | 124.84 | 16.79 | 0.89 |
| 75.00 | 10.50 | 124.77 | 16.72 | 0.85 |
| 76.00 | 11.50 | 124.67 | 16.62 | 0.82 |
| 77.00 | 12.50 | 124.57 | 16.52 | 0.79 |
| 78.00 | 13.50 | 124.50 | 16.45 | 0.76 |
| 79.00 | 14.50 | 124.41 | 16.36 | 0.74 |
| 80.00 | 15.50 | 124.31 | 16.26 | 0.71 |
| 81.00 | 16.50 | 124.28 | 16.23 | 0.69 |
| 83.00 | 18.50 | 124.08 | 16.03 | 0.65 |
| 85.00 | 20.50 | 123.96 | 15.91 | 0.62 |
| 87.00 | 22.50 | 123.86 | 15.81 | 0.59 |
| 89.00 | 24.50 | 123.79 | 15.74 | 0.56 |
| 91.00 | 26.50 | 123.68 | 15.63 | 0.54 |
| 93.00 | 28.50 | 123.61 | 15.56 | 0.51 |
| 95.00 | 30.50 | 123.53 | 15.48 | 0.49 |
| 97.00 | 32.50 | 123.46 | 15.41 | 0.47 |
| 99.00 | 34.50 | 123.41 | 15.36 | 0.46 |
| 101.00 | 36.50 | 123.37 | 15.32 | 0.44 |
| 106.00 | 41.50 | 123.24 | 15.19 | 0.41 |
| 111.00 | 46.50 | 123.18 | 15.13 | 0.38 |
| 116.00 | 51.50 | 123.08 | 15.03 | 0.35 |
| 121.00 | 56.50 | 122.99 | 14.94 | 0.33 |
| 126.00 | 61.50 | 122.94 | 14.89 | 0.31 |
| 131.00 | 66.50 | 122.86 | 14.81 | 0.29 |
| 136.00 | 71.50 | 122.79 | 14.74 | 0.28 |
| 141.00 | 76.50 | 122.75 | 14.70 | 0.27 |
| 146.00 | 81.50 | 122.68 | 14.63 | 0.25 |
| 151.00 | 86.50 | 122.62 | 14.57 | 0.24 |
| 161.00 | 96.50 | 122.50 | 14.45 | 0.22 |
| 171.00 | 106.50 | 122.45 | 14.40 | 0.21 |

| WELL 32-86 | | | | | |
|------------|---------|--------|----------|--|-----------|
| T | T' | Water | s' | | |
| Time | T Prime | Level | Rsd Drwn | | log(T/T') |
| (min.) | (min.) | (ft.) | (ft.) | | |
| 181.00 | 116.50 | 122.39 | 14.34 | | 0.19 |
| 191.00 | 126.50 | 122.29 | 14.24 | | 0.18 |
| 201.00 | 136.50 | 122.21 | 14.16 | | 0.17 |
| 211.00 | 146.50 | 122.12 | 14.07 | | 0.16 |
| 221.00 | 156.50 | 122.06 | 14.01 | | 0.15 |
| 232.50 | 168.00 | 121.98 | 13.93 | | 0.14 |
| 241.00 | 176.50 | 121.92 | 13.87 | | 0.14 |
| 251.00 | 186.50 | 121.86 | 13.81 | | 0.13 |
| 266.00 | 201.50 | 121.75 | 13.70 | | 0.12 |
| 281.00 | 216.50 | 121.65 | 13.60 | | 0.11 |
| 1425.00 | 1360.50 | 116.77 | 8.72 | | 0.02 |
| 1789.00 | 1724.50 | 115.06 | 7.01 | | 0.02 |
| 2814.00 | 2749.50 | 111.26 | 3.21 | | 0.01 |
| 3199.00 | 3134.50 | 109.70 | 1.65 | | 0.01 |

AQUIFER TEST DATA

WELL 32-86

TYPE OF AQUIFER TEST 3rd DOWN RECOVERY TEST
 HOW Q MEASURED 4 GPM BUCKET
 HOW W.L.'s MEASURED CHIMNEY
 RAD./DIST. OF/FROM PUMPING WELL 1"
 MEAS. POINT FOR W.L.'s _____
 ELEVATION OF MEAS. POINT _____

32-86-1
 11-19-86

PUMPING or OBSERVATION WELL
 PUMPING or RECOVERY DATA
 PAGE 1 OF 2

DEPTH OF PUMP/AIRPIPE _____
 PUMP ON: date 11-10-86 time 10:41:00
 PUMP OFF: date 11-10-86 time 11:45:30
 DURATION OF AQUIFER TEST _____

| TIME | | | | | WATER LEVEL DATA | | | | | DISCHARGE | | RECORDED BY | COMMENTS |
|------|------------|-----|----|-----------|------------------|---------------------------|--------------------------------------|---------|--------|-----------|---|-------------|----------------|
| DAY | CLOCK TIME | t | t' | at t' = 0 | READING | CONVERSIONS & CORRECTIONS | WATER LEVEL | s or s' | 108.05 | READING | Q | | |
| | | | | 110.10 | | | STATIC WATER LEVEL <u>105 + 3.05</u> | | | | | | |
| 1 | 11:48 | 0.0 | | | 125+3.63 | -2.50 | 126.13 | 18.08 | | | | CW | 10.41 S. 10.41 |
| | 11:49 | 1.0 | | | 125+3.25 | -2.50 | 125.75 | 17.70 | | | | CW | 10.41 S. 10.41 |
| | 11:49 1/2 | 1.5 | | | 125+3.10 | -2.50 | 125.60 | 17.55 | | | | " | Finished bail. |
| | 11:49 | 2.0 | | | 125+3.08 | | 125.58 | 17.53 | | | | " | 11:45:30 |
| | 11:49 1/2 | 2.5 | | | 125+3.06 | | 125.56 | 17.51 | | | | " | |
| | 11:50 | 3.0 | | | 125+2.96 | | 125.46 | 17.41 | | | | " | Rec. 3.75 gal. |
| | 11:50 1/2 | 3.5 | | | 125+2.96 | | 125.36 | 17.31 | | | | " | |
| | 11:51 | 4.0 | | | 125+2.25 | | 125.35 | 17.30 | | | | | |
| | 11:51 1/2 | 4.5 | | | 125+2.95 | | 125.25 | 17.20 | | | | | |
| | 11:52 | 5.0 | | | 125+2.70 | | 125.25 | 17.15 | | | | | |
| | 11:53 | 6.0 | | | 125+2.58 | | 125.25 | 17.03 | | | | | |
| | 11:54 | 7.0 | | | 125+2.46 | | 124.96 | 16.91 | | | | | |
| | 11:55 | 8 | | | 125+2.34 | | 124.84 | 16.79 | | | | | |
| | 11:56 | 9 | | | 125+2.22 | | 124.77 | 16.72 | | | | | |
| | 11:57 | 10 | | | 125+2.10 | | 124.67 | 16.62 | | | | | |
| | 11:58 | 11 | | | 125+2.00 | | 124.57 | 16.52 | | | | | |
| | 11:59 | 12 | | | 125+1.90 | | 124.50 | 16.45 | | | | | |
| | 12:00 | 13 | | | 125+1.71 | | 124.41 | 16.36 | | | | | |
| | 12:01 | 14 | | | 125+1.60 | | 124.31 | 16.26 | | | | | |
| | 12:02 | 15 | | | 125+1.48 | | 124.23 | 16.23 | | | | | |
| | 12:03 | 16 | | | 125+1.36 | | 124.08 | 16.03 | | | | | |
| | 12:04 | 17 | | | 125+1.24 | | 123.96 | 15.91 | | | | | |
| | 12:05 | 18 | | | 125+1.12 | | 123.84 | 15.81 | | | | | |
| | 12:06 | 19 | | | 125+1.00 | | 123.72 | 15.74 | | | | | |
| | 12:07 | 20 | | | 125+0.88 | | 123.60 | 15.63 | | | | | |
| | 12:08 | 21 | | | 125+0.76 | | 123.51 | 15.56 | | | | | |
| | 12:09 | 22 | | | 125+0.64 | | 123.43 | 15.48 | | | | | |
| | 12:10 | 23 | | | 125+0.52 | | 123.34 | 15.41 | | | | | |
| | 12:11 | 24 | | | 125+0.40 | | 123.24 | 15.36 | | | | | |
| | 12:12 | 25 | | | 125+0.28 | | 123.14 | 15.32 | | | | | |
| | 12:13 | 26 | | | 125+0.16 | | 123.04 | 15.19 | | | | | |
| | 12:14 | 27 | | | 125+0.04 | | 122.94 | 15.13 | | | | | |
| | 12:15 | 28 | | | 125+0.00 | | 122.84 | 15.03 | | | | | |
| | 12:16 | 29 | | | 125+0.00 | | 122.74 | 14.94 | | | | | |
| | 12:17 | 30 | | | 125+0.00 | | 122.64 | 14.84 | | | | | |
| | 12:18 | 31 | | | 125+0.00 | | 122.54 | 14.74 | | | | | |
| | 12:19 | 32 | | | 125+0.00 | | 122.44 | 14.63 | | | | | |
| | 12:20 | 33 | | | 125+0.00 | | 122.34 | 14.57 | | | | | |
| | 12:21 | 34 | | | 125+0.00 | | 122.24 | 14.51 | | | | | |
| | 12:22 | 35 | | | 125+0.00 | | 122.14 | 14.45 | | | | | |

HYDRO-SEARCH

RENO • DENVER

CONSULTING HYDROLOGISTS-GEOLOGISTS

WELL 32-86
PUMPING or OBSERVATION WELL
PUMPING or RECOVERY DATA
PAGE 2 OF 2

DEPTH OF PUMP/AIRPIPE _____
PUMP ON: date 11-10-96 time _____
PUMP OFF: date 11-12-96 time _____
DURATION OF AQUIFER TEST _____

[illegible]

LOCATION Sunder, B
PERSONNEL M. E. Evans, C. A. [illegible]

PROJECT 100100002
100100002

PACKER TEST ANALYSIS
 WELL NO. 32-86
 ROCKY FLATS PLANT JOB NO. 106PO6222
 DATE TESTED: 9/26/86 BY: J. BERGMAN
 TEST INTERVAL (FEET BELOW G.S.): 45.20 - 55.20
 MATERIAL TESTED: ARAPAHOE CLAYSTONE
 DEPTH TO WATER (FEET BELOW G.S.): 63.88

$$K = \frac{Q}{2(\pi)(L)(H)} \ln\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00106954 (FEET³/MIN)
 L = LENGTH OF TEST INTERVAL = 10.00 FEET
 TEST INTERVAL IS ABOVE WATER TABLE
 HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
 + GAGE PRESSURE (IN FEET)
 = 50.20 + 6.20 + 3.50 * 2.31 = 64.49
 R = BOREHOLE RADIUS = .16 FEET

 K = HYDRAULIC CONDUCTIVITY = .00000110 FT/MIN
 K = .00000056 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00180062 (FEET³/MIN)
 L = LENGTH OF TEST INTERVAL = 10.00 FEET
 TEST INTERVAL IS ABOVE WATER TABLE
 HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
 + GAGE PRESSURE (IN FEET)
 = 50.20 + 6.20 + 8.00 * 2.31 = 74.88
 R = BOREHOLE RADIUS = .16 FEET

 K = HYDRAULIC CONDUCTIVITY = .00000159 FT/MIN
 K = .00000081 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00027077 (FEET³/MIN)
 L = LENGTH OF TEST INTERVAL = 10.00 FEET
 TEST INTERVAL IS ABOVE WATER TABLE
 HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
 + GAGE PRESSURE (IN FEET)
 = 50.20 + 6.20 + 3.00 * 2.31 = 63.33
 R = BOREHOLE RADIUS = .16 FEET

 K = HYDRAULIC CONDUCTIVITY = .00000028 FT/MIN
 K = .00000014 CM/SEC

PACKER TEST ANALYSIS
 WELL NO. 32-86
 ROCKY FLATS PLANT JOB NO. 106PO6222
 DATE TESTED: 9/26/86 BY: J. BERGMAN
 TEST INTERVAL (FEET BELOW G.S.): 55.20 - 65.20
 MATERIAL TESTED: ARAPAHOE CLAYSTONE
 DEPTH TO WATER (FEET BELOW G.S.): 63.88

$$K = \frac{Q}{2(P_1)(L)(H)} \ln\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00062277 (FEET³/MIN)
 L = LENGTH OF TEST INTERVAL = 10.00 FEET
 TEST INTERVAL IS ABOVE WATER TABLE
 HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
 + GAGE PRESSURE (IN FEET)
 = 60.20 + 6.20 + 3.50 * 2.31 = 74.48
 R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000055 FT/MIN
 K = .00000028 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00016246 (FEET³/MIN)
 L = LENGTH OF TEST INTERVAL = 10.00 FEET
 TEST INTERVAL IS ABOVE WATER TABLE
 HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
 + GAGE PRESSURE (IN FEET)
 = 60.20 + 6.20 + 10.50 * 2.31 = 90.65
 R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000012 FT/MIN
 K = .00000006 CM/SEC

2ND P1/3 TEST

TEST ABORTED

PACKER TEST ANALYSIS
WELL NO. 32-86
ROCKY FLATS PLANT JOB NO. 106PO6222
DATE TESTED: 9/26/86 BY: J. BERGMAN
TEST INTERVAL (FEET BELOW G.S.): 65.20 - 75.20
MATERIAL TESTED: ARAPAHOE CLAYSTONE
DEPTH TO WATER (FEET BELOW G.S.): 63.88

$$K = \frac{Q}{2(\pi)(L)(H)} \ln\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00104246 (FEET³/MIN)
L = LENGTH OF TEST INTERVAL = 10.00 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 63.88 + 6.20 + 3.00 * 2.31 = 77.01
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000090 FT/MIN
K = .00000046 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00188185 (FEET³/MIN)
L = LENGTH OF TEST INTERVAL = 10.00 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 63.88 + 6.20 + 12.80 * 2.31 = 99.65
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000125 FT/MIN
K = .00000064 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00041969 (FEET³/MIN)
L = LENGTH OF TEST INTERVAL = 10.00 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 63.88 + 6.20 + 2.00 * 2.31 = 74.70
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000037 FT/MIN
K = .00000019 CM/SEC

PACKER TEST ANALYSIS
 WELL NO. 32-86
 ROCKY FLATS PLANT JOB NO. 106PO6222
 DATE TESTED: 9/26/86 BY: J. BERGMAN
 TEST INTERVAL (FEET BELOW G.S.): 75.20 - 85.20
 MATERIAL TESTED: ARAPAHOE CLAYSTONE
 DEPTH TO WATER (FEET BELOW G.S.): 63.88

$$K = \frac{Q}{2(P_1)(L)(H)} \ln\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00018954 (FEET³/MIN)
 L = LENGTH OF TEST INTERVAL = 10.00 FEET
 TEST INTERVAL IS BELOW WATER TABLE
 HEAD = DEPTH TO WATER + GAGE HEIGHT
 + GAGE PRESSURE (IN FEET)
 = 63.88 + 6.20 + 3.00 * 2.31 = 77.01
 R = BOREHOLE RADIUS = .16 FEET

 K = HYDRAULIC CONDUCTIVITY = .00000016 FT/MIN
 K = .00000008 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00115077 (FEET³/MIN)
 L = LENGTH OF TEST INTERVAL = 10.00 FEET
 TEST INTERVAL IS BELOW WATER TABLE
 HEAD = DEPTH TO WATER + GAGE HEIGHT
 + GAGE PRESSURE (IN FEET)
 = 63.88 + 6.20 + 15.50 * 2.31 = 105.89
 R = BOREHOLE RADIUS = .16 FEET

 K = HYDRAULIC CONDUCTIVITY = .00000072 FT/MIN
 K = .00000037 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00013539 (FEET³/MIN)
 L = LENGTH OF TEST INTERVAL = 10.00 FEET
 TEST INTERVAL IS BELOW WATER TABLE
 HEAD = DEPTH TO WATER + GAGE HEIGHT
 + GAGE PRESSURE (IN FEET)
 = 63.88 + 6.20 + 2.50 * 2.31 = 75.86
 R = BOREHOLE RADIUS = .16 FEET

 K = HYDRAULIC CONDUCTIVITY = .00000012 FT/MIN
 K = .00000006 CM/SEC

PACKER TEST ANALYSIS
 WELL NO. 32-86
 ROCKY FLATS PLANT JOB NO. 106PO6222
 DATE TESTED: 9/26/86 BY: J. BERGMAN
 TEST INTERVAL (FEET BELOW G.S.): 85.20 - 95.20
 MATERIAL TESTED: ARAPAHOE CLAYSTONE
 DEPTH TO WATER (FEET BELOW G.S.): 63.88

$$K = \frac{Q}{2(\pi)(L)(H)} \ln\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00035200 (FEET3/MIN)
 L = LENGTH OF TEST INTERVAL = 10.00 FEET
 TEST INTERVAL IS BELOW WATER TABLE
 HEAD = DEPTH TO WATER + GAGE HEIGHT
 + GAGE PRESSURE (IN FEET)
 = 63.88 + 6.20 + 3.00 * 2.31 = 77.01
 R = BOREHOLE RADIUS = .16 FEET

 K = HYDRAULIC CONDUCTIVITY = .00000030 FT/MIN
 K = .00000015 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00024369 (FEET3/MIN)
 L = LENGTH OF TEST INTERVAL = 10.00 FEET
 TEST INTERVAL IS BELOW WATER TABLE
 HEAD = DEPTH TO WATER + GAGE HEIGHT
 + GAGE PRESSURE (IN FEET)
 = 63.88 + 6.20 + 17.50 * 2.31 = 110.50
 R = BOREHOLE RADIUS = .16 FEET

 K = HYDRAULIC CONDUCTIVITY = .00000015 FT/MIN
 K = .00000007 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00013539 (FEET3/MIN)
 L = LENGTH OF TEST INTERVAL = 10.00 FEET
 TEST INTERVAL IS BELOW WATER TABLE
 HEAD = DEPTH TO WATER + GAGE HEIGHT
 + GAGE PRESSURE (IN FEET)
 = 63.88 + 6.20 + 2.00 * 2.31 = 74.70
 R = BOREHOLE RADIUS = .16 FEET

 K = HYDRAULIC CONDUCTIVITY = .00000012 FT/MIN
 K = .00000006 CM/SEC

PACKER TEST ANALYSIS
WELL NO. 32-86
ROCKY FLATS PLANT JOB NO. 106P06222
DATE TESTED: 9/26/86 BY: J. BERGMAN
TEST INTERVAL (FEET BELOW G.S.): 95.20 - 105.20
MATERIAL TESTED: ARAPAHOE CLAYSTONE
DEPTH TO WATER (FEET BELOW G.S.): 63.88

$$K = \frac{Q}{2(\pi)(L)(H)} \frac{L}{\ln\left(\frac{L}{R}\right)}$$

1ST P1/3 TEST

Q = INJECTION RATE = .00085293 (FEET³/MIN)
L = LENGTH OF TEST INTERVAL = 10.00 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 63.88 + 6.20 + 3.00 * 2.31 = 77.01
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000073 FT/MIN
K = .00000037 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00140800 (FEET³/MIN)
L = LENGTH OF TEST INTERVAL = 10.00 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 63.88 + 6.20 + 20.00 * 2.31 = 116.28
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000080 FT/MIN
K = .00000041 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00014892 (FEET³/MIN)
L = LENGTH OF TEST INTERVAL = 10.00 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 63.88 + 6.20 + 3.00 * 2.31 = 77.01
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000013 FT/MIN
K = .00000007 CM/SEC

PACKER TEST ANALYSIS
 WELL NO. 32-86
 ROCKY FLATS PLANT JOB NO. 106PO6222
 DATE TESTED: 9/26/86 BY: J. BERGMAN
 TEST INTERVAL (FEET BELOW G.S.): 95.20 - 105.92
 MATERIAL TESTED: ARAPAHOE CLAYSTONE
 DEPTH TO WATER (FEET BELOW G.S.): 63.88

$$K = \frac{Q}{2(\pi)(L)(H)} \ln\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00085293 (FEET³/MIN)
 L = LENGTH OF TEST INTERVAL = 10.72 FEET
 TEST INTERVAL IS BELOW WATER TABLE
 HEAD = DEPTH TO WATER + GAGE HEIGHT
 + GAGE PRESSURE (IN FEET)
 = 63.88 + 6.20 + 3.00 * 2.31 = 77.01
 R = BOREHOLE RADIUS = .16 FEET

 K = HYDRAULIC CONDUCTIVITY = .00000070 FT/MIN
 K = .00000035 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00140800 (FEET³/MIN)
 L = LENGTH OF TEST INTERVAL = 10.72 FEET
 TEST INTERVAL IS BELOW WATER TABLE
 HEAD = DEPTH TO WATER + GAGE HEIGHT
 + GAGE PRESSURE (IN FEET)
 = 63.88 + 6.20 + 20.00 * 2.31 = 116.28
 R = BOREHOLE RADIUS = .16 FEET

 K = HYDRAULIC CONDUCTIVITY = .00000076 FT/MIN
 K = .00000039 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00014892 (FEET³/MIN)
 L = LENGTH OF TEST INTERVAL = 10.72 FEET
 TEST INTERVAL IS BELOW WATER TABLE
 HEAD = DEPTH TO WATER + GAGE HEIGHT
 + GAGE PRESSURE (IN FEET)
 = 63.88 + 6.20 + 3.00 * 2.31 = 77.01
 R = BOREHOLE RADIUS = .16 FEET

 K = HYDRAULIC CONDUCTIVITY = .00000012 FT/MIN
 K = .00000006 CM/SEC

PACKER TEST ANALYSIS
WELL NO. 32-86
ROCKY FLATS PLANT JOB NO. 106PO6222
DATE TESTED: 9/26/86 BY: J. BERGMAN
TEST INTERVAL (FEET BELOW G.S.): 105.20 - 115.20
MATERIAL TESTED: ARAPAHOE CLAYSTONE
DEPTH TO WATER (FEET BELOW G.S.): 63.88

$$K = \frac{Q}{2(P_1)(L)(H)} \ln\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00013539 (FEET³/MIN)
L = LENGTH OF TEST INTERVAL = 10.00 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 63.88 + 6.20 + 3.00 * 2.31 = 77.01
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000012 FT/MIN
K = .00000006 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00163816 (FEET³/MIN)
L = LENGTH OF TEST INTERVAL = 10.00 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 63.88 + 6.20 + 22.00 * 2.31 = 120.90
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000090 FT/MIN
K = .00000046 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00029785 (FEET³/MIN)
L = LENGTH OF TEST INTERVAL = 10.00 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 63.88 + 6.20 + 3.00 * 2.31 = 77.01
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000026 FT/MIN
K = .00000013 CM/SEC

PACKER TEST ANALYSIS
WELL NO. 32-86
ROCKY FLATS PLANT JOB NO. 106P06222
DATE TESTED: 9/26/86 BY: J. BERGMAN
TEST INTERVAL (FEET BELOW G.S.): 116.08 - 126.08
MATERIAL TESTED: ARAPAHOE SANDSTONE
DEPTH TO WATER (FEET BELOW G.S.): 63.88

$$K = \frac{Q}{2(PI)(L)(H)} \frac{L}{LN(\frac{L}{R})}$$

1ST P1/3 TEST

Q = INJECTION RATE = .00086646 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 10.00 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 63.88 + 6.20 + 3.00 * 2.31 = 77.01
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000074 FT/MIN
K = .00000038 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00174647 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 10.00 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 63.88 + 6.20 + 24.00 * 2.31 = 125.52
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000092 FT/MIN
K = .00000047 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00050092 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 10.00 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 63.88 + 6.20 + 3.00 * 2.31 = 77.01
R = BOREHOLE RADIUS = .16 FEET

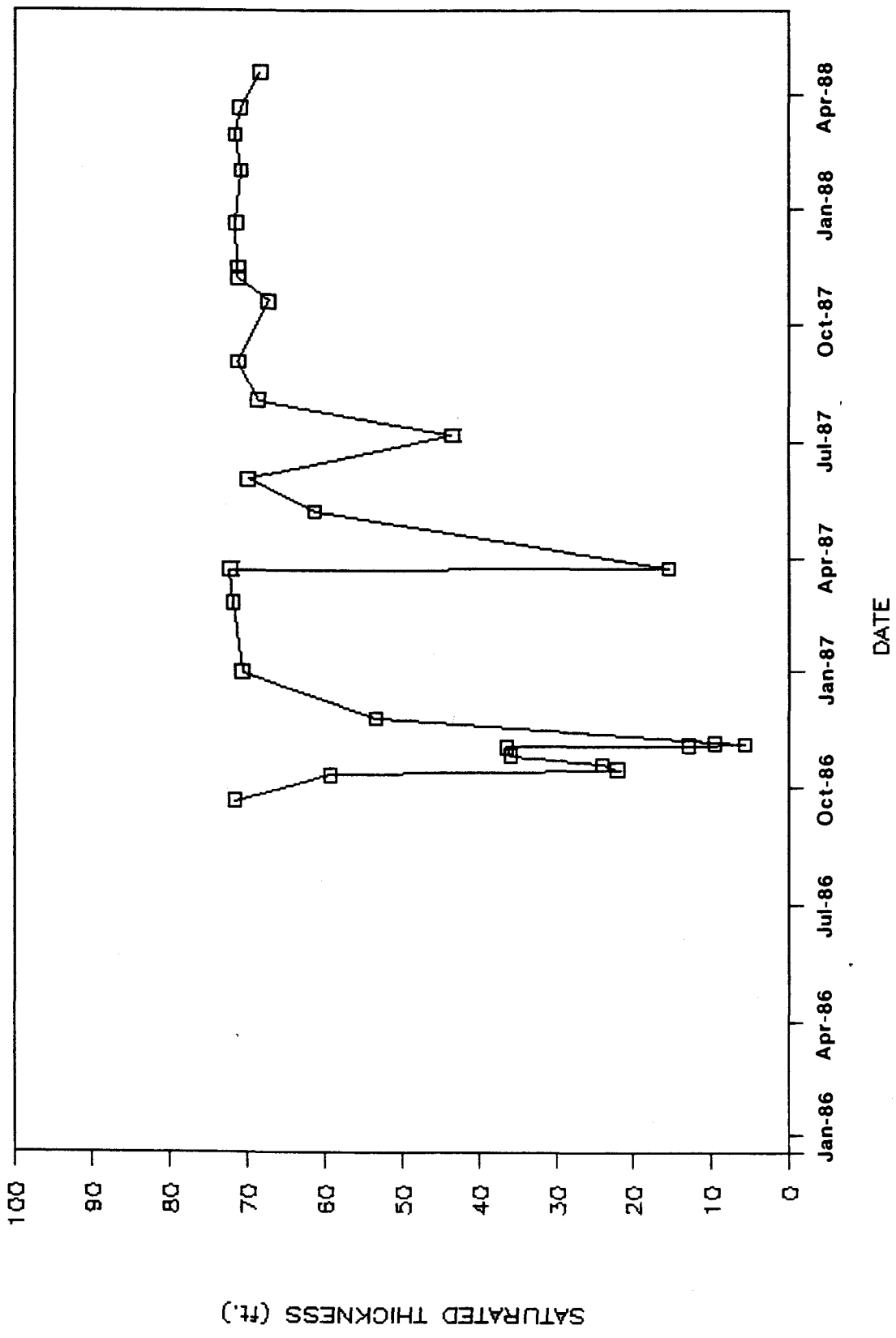
K = HYDRAULIC CONDUCTIVITY = .00000043 FT/MIN
K = .00000022 CM/SEC

ROCKY FLATS SOLAR PONDS

WATER LEVEL SUMMARY

| WELL NUMBER | DATE | GROUND SURFACE ELEVATION | TOP OF CASING ELEVATION | STICK UP | DEPTH OF SI BASE | WATER DEPTH BELOW TOC | WATER SURFACE ELEVATION |
|----------------|----------|--------------------------------|-------------------------------|-------------|------------------------|-----------------------------|-------------------------------|
| 3286 | 09/22/86 | 5964.46 | 5966.96 | 2.50 | 125.50 | 54.00 | 5912.96 |
| | 09/22/86 | | | | | 54.00 | 5912.96 |
| | 10/13/86 | | | | | 66.34 | 5900.62 |
| | 10/17/86 | | | | | 103.5 | 5863.46 |
| | 10/21/86 | | | | | 101.5 | 5865.44 |
| | 10/28/86 | | | | | 89.67 | 5877.29 |
| | 11/04/86 | | | | | 89.20 | 5877.76 |
| | 11/05/86 | | | | | 112.6 | 5854.36 |
| | 11/06/86 | | | | | 119.8 | 5847.19 |
| | 11/07/86 | | | | | 115.9 | 5851.07 |
| | 11/26/86 | | | | | 72.32 | 5894.64 |
| | 01/01/87 | | | | | 54.92 | 5912.04 |
| | 02/25/87 | | | | | 53.77 | 5913.19 |
| | 03/23/87 | | | | | 53.33 | 5913.63 |
| | 03/24/87 | | | | | 110.0 | 5856.96 |
| | 05/08/87 | | | | | 64.33 | 5902.63 |
| | 06/03/87 | | | | | 55.74 | 5911.22 |
| | 07/08/87 | | | | | 82.10 | 5884.86 |
| | 08/04/87 | | | | | 57.00 | 5909.96 |
| | 09/03/87 | | | | | 54.40 | 5912.56 |
| | 10/21/87 | | | | | 58.30 | 5908.66 |
| | 11/09/87 | | | | | 54.40 | 5912.56 |
| | 11/17/87 | | | | | 54.40 | 5912.56 |
| | 12/22/87 | | | | | 54.10 | 5912.86 |
| | 02/01/88 | | | | | 54.80 | 5912.16 |
| | 02/29/88 | | | | | 54.00 | 5912.96 |
| | 03/21/88 | | | | | 54.70 | 5912.26 |
| | 04/18/88 | | | | | 57.20 | 5909.76 |

SATURATED THICKNESS IN WELL # 32-86 (SP)



INDEX OF DATA

Boring No.: 33-86

Completed as well? Yes

Data in File

- ☒ Log of Borehole
- ☒ Well Construction Summaries
- ☐ Well Development Summaries
- ☐ Hydraulic Conductivity Test Data and Results
- ☐ Packer Test Data and Results
- ☒ Water Level Data
- ☐ Saturated Thickness Hydrographs

Project: Rocky Flats Plant


LOG OF BORING NO. 33-86

Date Drilled 9/10/86


Coordinates N 36960.9 E 21896.5

Boring Method Hollow Stem Auger

Ground Surface Elevation 5949.28'

| Elev. (feet) | Depth (feet) | Sample Type | Graphic Log | Material Description | Penetration Resistance (Blows/inch) | | Water Content (%) | | Other Tests |
|-----------------|-----------------|----------------|---|---|---|----|-------------------------|----|----------------|
| | | | | | 20 | 40 | 20 | 40 | |
| | 0 | |  | ROCKY FLATS ALLUVIUM 0-4.8'-Sample. Recovered 3.1/4.8' = 65%. GRAVEL: light olive gray (5Y 5/2) to olive gray (5Y 3/2); clayey silt and sand matrix; quartzite pebbles; poorly sorted; subangular; crumbles; dry. 4.8-6.8'-Sample. Recovered 2.0/2.0' = 100%. GRAVEL: light olive gray (5Y 5/2); clayey sand matrix; quartzite cobbles and gravel clasts; angular to subangular; moderate sorting; loose; dry. ARAPAHOE FORMATION 6.8-11.8'-Sample. Recovered 5.0/5.0' = 100%. 6.8-7.0': GRAVEL: light olive gray (5Y 5/2); clayey sand matrix; quartzite cobbles and gravel clasts; angular to subangular; moderate sorting; loose; dry. 7.0-11.8': CLAYSTONE: grayish yellow green (5GY 7/2) to grayish olive green (5GY 3/2) with olive gray (5Y 3/2) to greenish gray (5GY 6/1) and dark yellowish orange (10YR 6/6) stains; well sorted; consolidated; fractured; firm; damp. | | | | | |
| | 5 | | | | | | | | |
| | 10 | | | | | | | | |
| | 15 | | | | | | | | |
| | 20 | | | | | | | | |

Remarks Logged by: T. Murphy

Checked by: 

Project No.

106P06222

Hydro-Search, Inc.

Page 1 of 2

LOG OF BORING NO. 33-86

Date Drilled 9/10/86

Coordinates N 36960.9 E 21896.5

Boring Method Hollow Stem Auger

Ground Surface Elevation 5949.28'

| Elev. (feet) | Depth (feet) | Sample Type | Graphic Log | Material Description | Penetration Resistance (Blows/Inch) | | Water Content (%) | | Other Tests |
|-----------------|-----------------|----------------|----------------|--|---|----|-------------------------|----|----------------|
| | | | | | 20 | 40 | 20 | 40 | |
| | 20 | | | | | | | | |
| | 25 | | | | | | | | |
| | 30 | | | | | | | | |
| | 35 | | | <p>11.8-16.8'-Sample. Recovered 5.0/5.0'=100%. RQD 5.0/5.0'=100%. CLAYSTONE: grayish yellow green (5GY 7/2) to grayish olive green (5GY 3/2) with olive gray (5Y 3/2) to greenish gray (5GY 6/1) and dark yellowish orange (10YR 6/6) stains; well sorted; consolidated; fractured; firm; damp.</p> | | | | | |
| | | | | TOTAL DEPTH: 16.8' | | | | | |
| | 40 | | | | | | | | |

Remarks Logged by: T. Murphy

Checked by: _____

Project No.

106P06222

Hydro-Search, Inc.

Page 2 of 2

WELL CONSTRUCTION SUMMARY

LOCATION or COORDS: N 36960.8 E 21896.5

ELEVATION: GROUND LEVEL 5949.28'
TOP OF CASING 5950.70'

DRILLING SUMMARY:

TOTAL DEPTH Well: 7.34' Hole: 16.80'

BOREHOLE DIAMETER 7 1/4"

DRILLER Boyles Brothers Drilling Co.

15865 W. 5th Avenue

Golden, CO (Dave Jarvie)

RIG Mobile B-57

BIT(S) _____ T5

DRILLING FLUID _____ None

SURFACE CASING 5" x 4' steel w/ locking cap

WELL DESIGN:

BASIS: GEOLOGIC LOG ____ GEOPHYSICAL LOG ____

CASING STRING(S): C= CASING S=SCREEN

0.00' 2.99' C1

2.99' - 7.34' SI

CASING: C1 2" I.D. Sch. 5 type 316 stain-
less steel, threaded and flush
jointed.

SCREEN: SI 2" I.D. Sch. 5 type 316 stain-
less steel, threaded and flush
jointed, 0.010" wire wrap screen,
0.25' welded bottom cap.

CENTRALIZERS Type 304 stainless steel
4.07' - 5.32'

FILTER MATERIAL 32-42 silica sand
2.50' - 7.50'

CEMENT Portland Type I
0.00' - 2.00'

OTHER 3/8" bentonite pellets
2.00' - 2.50'

7.50' - 16.40'

CONSTRUCTION TIME LOG:

| TASK | START | | FINISH | |
|-------------------|-------|------|--------|------|
| | DATE | TIME | DATE | TIME |
| DRILLING: | 1986 | | 1986 | |
| 7 1/2" auger | 9/10 | 1055 | 9/10 | 1130 |
| | | | | |
| | | | | |
| GEOPHYS. LOGGING: | — | — | — | — |
| CASING: | | | | |
| 2" stainless | 9/10 | 1310 | 9/10 | 1317 |
| | | | | |
| | | | | |
| FILTER PLACEMENT: | 9/10 | 1302 | 9/10 | 1305 |
| | 9/10 | 1331 | 9/10 | 1335 |
| CEMENTING: | | | | |
| DEVELOPMENT: | 9/12 | 1530 | 9/12 | 1530 |
| OTHER: | | | | |
| Bentonite | 9/10 | 1305 | 9/10 | 1310 |
| | 9/10 | 1250 | 9/10 | 1255 |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

WELL DEVELOPMENT

See Well Development Summary Sheet.

COMMENTS:

No water encountered during drilling.

Top of stainless steel casing: 1.42'

Cave from TD to 16.40'

LOCATION Golden, CO
PERSONNEL T. Murphy

PROJECT 106P06222
Rocky Flats Plant

PROJECT

ROCKY FLATS SOLAR PONDS

WATER LEVEL SUMMARY

| <u>WELL</u> <u>NUMBER</u> | <u>DATE</u> | <u>GROUND</u> <u>SURFACE</u> <u>ELEVATION</u> | <u>TOP OF</u> <u>CASING</u> <u>ELEVATION</u> | <u>STICK</u> <u>UP</u> | <u>DEPTH</u> <u>OF S1</u> <u>BASE</u> | <u>WATER</u> <u>DEPTH</u> <u>BELOW TOC</u> | <u>WATER</u> <u>SURFACE</u> <u>ELEVATION</u> |
|------------------------------|-------------|---|--|---------------------------|---|--|--|
| 3386 | 09/12/86 | 5949.28 | 5950.70 | 1.42 | 7.34 | -1.00 | DRY |
| | 10/13/86 | | | | | -1.00 | DRY |
| | 11/26/86 | | | | | -1.00 | DRY |
| | 01/01/87 | | | | | -1.00 | DRY |
| | 02/25/87 | | | | | -1.00 | DRY |
| | 03/24/87 | | | | | -1.00 | DRY |
| | 05/08/87 | | | | | -1.00 | DRY |
| | 06/03/87 | | | | | -1.00 | DRY |
| | 07/08/87 | | | | | -1.00 | DRY |
| | 08/04/87 | | | | | -1.00 | DRY |
| | 09/03/87 | | | | | -1.00 | DRY |
| | 09/24/87 | | | | | -1.00 | DRY |
| | 10/21/87 | | | | | -1.00 | DRY |
| | 11/09/87 | | | | | -1.00 | DRY |
| | 12/01/87 | | | | | -1.00 | DRY |
| | 12/21/87 | | | | | -1.00 | DRY |
| | 01/11/88 | | | | | -1.00 | DRY |
| | 02/29/88 | | | | | -1.00 | DRY |
| | 03/21/88 | | | | | -1.00 | DRY |
| | 04/18/88 | | | | | -1.00 | DRY |

INDEX OF DATA

Boring No.: 34-86

Completed as well? Yes

Data in File

- X Log of Borehole
- X Well Construction Summaries
- Well Development Summaries
- X Hydraulic Conductivity Test Data
and Results
- X Packer Test Data and Results
- X Water Level Data
- Saturated Thickness Hydrographs

Project: Rocky Flats Plant

LOG OF BORING NO. 34-86

Date Drilled 8/20/86, 8/26/86, 8/28/86

Coordinates N 37171.4 E 23088.4

Boring Method Hollow Stem Auger/NC Core

Ground Surface Elevation 5910.44'

| Elev. (feet) | Depth (feet) | Sample Type | Graphic Log | Material Description | Penetration Resistance (Blows/Inch) | | Water Content (%) | | Other Tests |
|-----------------|-----------------|----------------|----------------|--|---|----|-------------------------|----|----------------|
| | | | | | 20 | 40 | 20 | 40 | |
| | 0 | | | VALLEY FILL | | | | | |
| | | | | 0-1.3'-Sample. Recovered 1.3/1.3'=100%. CLAY: grayish olive (10Y 4/2) to light olive gray (5Y 5/2) silty clay; some sand, gravel and cobbles; subrounded; poorly sorted; grasses at surface; dry. | | | | | |
| | 5 | | | 2.0-4.0'-Sample. Recovered 1.9/2.0'=95%. SILTY CLAY: moderate to dark yellowish brown (10YR 6/2); white feldspar grains along with quartzite and granite particles; poorly sorted; subangular; few roots; dry. | | | | | |
| | | | | 4.0-7.0'-Sample. Recovered 0.0/3.0'=0%. | | | | | |
| | 10 | | | 7.0-12.0'-Sample. Recovered 2.5/5.0'=50%. CLAYSTONE: olive gray (5Y 4/1); trace silt and sand; gravel lense at 8.6'; grades downward into light olive gray (5Y 5/2) clay; large subrounded cobble at bottom; soft; sticky; damp to moist. | | | | | |
| | | | | 12.0-17.0'-Sample. Recovered 2.7/5.0'=54%. | | | | | |
| | 15 | | | 12.0-16.1'. GRAVEL: light olive gray (5Y 5/2) with abundant pink granite and quartzite; poorly sorted; angular to subangular; some sand; trace clay; wet. | | | | | |
| | | | | ARAPAHOE FORMATION | | | | | |
| | 20 | | | 16.1-17.0'. CLAYSTONE: dusky yellow (5Y 7/6); abundant medium light gray (N 6) horizontal mottles; well sorted; consolidated; firm; damp. | | | | | |

Remarks

Logged by: T. Murphy & L. Pivonka

Checked by: *[Signature]*

Project No.

106P06222

Hydro-Search, Inc.

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Project: Rocky Flats Plant

LOG OF BORING NO. 34-86

Date Drilled 8/20/86, 8/26/86, 8/28/86

Coordinates N 37171.4 E 23088.4

Boring Method Hollow Stem Auger/NC Core

Ground Surface Elevation 5910.44'

| Elev. (feet) | Depth (feet) | Sample Type | Graphic Log | Material Description | Penetration Resistance (Blows/inch) | | Water Content (%) | | Other Tests |
|-----------------|-----------------|----------------|----------------|---|---|----|-------------------------|----|----------------|
| | | | | | 20 | 40 | 20 | 40 | |
| | 20 | | | 17.0-22.8'-Sample. Recovered 4.8/4.8'=100%. CLAYSTONE: light olive gray (5Y 5/2) clay with some silt; dark yellowish orange (10YR 6/6) mottles; well sorted; firm; damp. | | | | | |
| | 25 | | | 22.8-27.8'-Sample. Recovered 5.0/5.0'=100%. CLAYSTONE: light olive gray (5Y 5/2); some silt; some dark yellowish orange (10YR 6/6) mottles; well sorted; firm; damp. | | | | | |
| | 30 | | | 27.8-32.8'-Sample. Recovered 5.0/5.0'=100%. CLAYSTONE: light olive gray (5Y 5/2) and medium gray (N 5); limonite stains dark yellowish orange (10YR 6/6) abundant; black wood fragments common; trace silt and sand; iron stain along fractures; well sorted; firm; damp. | | | | | |
| | 35 | | | 32.8-37.8'-Sample. Recovered 5.0/5.0'=100%. CLAYSTONE: olive gray (5Y 3/2) with minor dark yellowish orange (10YR 6/6) limonite stains; black wood fragments common; trace silt and sand; well sorted; firm; damp. | | | | | |
| | 40 | | | 38.0-43.8'-Sample. Recovered 5.8/5.8'=100%. CLAYSTONE: dark gray (N 3); silty with trace of FeO stringers; some charcoal wood fragments; well sorted; consolidated; damp. | | | | | |

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Project No.
106P06222

Hydro-Search, Inc.

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Project: Rocky Flats Plant

LOG OF BORING NO. 34-86

Date Drilled 8/20/86, 8/26/86, 8/28/86

Coordinates N 37171.4 E 23088.4

Boring Method Hollow Stem Auger/NC Core

Ground Surface Elevation 5910.44'

| Elev. (feet) | Depth (feet) | Sample Type | Graphic Log | Material Description | Penetration Resistance (Blows/inch) | | Water Content (%) | | Other Tests |
|-----------------|-----------------|----------------|----------------|--|---|----|-------------------------|----|----------------|
| | | | | | 20 | 40 | 20 | 40 | |
| | 40 | | | 43.8-45.0'-Sample. Recovered 1.2/1.2'=100%. SANDSTONE: dark gray (N 3); clay-rich; greenish gray (5GY 6/1) clay; well sorted; consolidated; damp. | | | | | |
| | 45 | | | 45.0-48.0'-Sample. Recovered 3.0/3.0'=100%. SANDSTONE: medium gray (N 5) laminated sandstone 0.5" thick with dark gray (N 3) claystone interbeds 0.1" thick; some of the thicker laminae contain coal material; very light gray (N 8) sandy clasts within the lower 1.5'; well sorted; consolidated; damp. | | | | | |
| | 50 | | | 48.0-52.3'-Sample. Recovered 0.2/4.3'=5%. SANDSTONE: medium light gray (N 6); silty; laminated; well sorted; consolidated; damp. | | | | | |
| | 55 | | | 52.3-53.4'-Sample. Recovered 1.1/1.1'=100%. SANDSTONE: medium light gray (N 6); silty; laminated; well sorted; consolidated; damp. | | | | | |
| | 60 | | | 53.4-54.4'-Sample. Recovered 1.0/1.0'=100%. SANDSTONE: medium gray (N 5); laminated; well cemented with calcium carbonate; consolidated; damp. | | | | | |

Remarks

Logged by: T. Murphy & L. Pivonka

Checked by: 

Project No.
106P06222

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Project: Rocky Flats Plant

LOG OF BORING NO. 34-86

Date Drilled 8/20/86, 8/26/86, 8/28/86

Coordinates N 37171.4 E 23088.4

Boring Method Hollow Stem Auger/NC Core

Ground Surface Elevation 5910.44'

| Elev. (feet) | Depth (feet) | Sample Type | Graphic Log | Material Description | Penetration Resistance (Blows/Inch) | | Water Content (%) | | Other Tests |
|-----------------|-----------------|----------------|----------------|---|---|----|-------------------------|----|----------------|
| | | | | | 20 | 40 | 20 | 40 | |
| | 60 | | | 54.4-55.6'-Sample. Recovered 1.2/1.2'=100%. SANDSTONE: medium gray (N 5); laminated; well cemented with calcium carbonate; consolidated; damp. | | | | | |
| | | | | 55.6-59.3'-Sample. Recovered 3.7/3.7'=100%. CLAYSTONE: dark gray (N 3); variable quantities of silt and sand; abundant clay; consolidated; well sorted; firm; moist. | | | | | |
| | 65 | | | 59.3-62.5'-Sample. Recovered 3.2/3.2'=100%. CLAYSTONE: dark gray (N 3); silty; light gray (N 7) mottling; firm; consolidated; well sorted; moist. | | | | | |
| | | | | 62.5-64.5'-Sample. Recovered 2.0/2.0'=100%. SANDSTONE: light gray (N 7) clay laminated sandstone; gradational contact; well sorted; consolidated; moist. | | | | | |
| | 70 | | | 64.5-69.3'-Sample. Recovered 4.8/4.8'=100%. SANDSTONE: light gray (N 7) and medium light gray (N 6) silty sandstone with trace of wood fossils; sand content increases with depth; consolidated; well sorted; firm; dry. | | | | | |
| | 75 | | | 69.3-71.0'-Sample. Recovered 1.7/1.7'=100%. CLAYSTONE: medium gray (N 5) silty and fine- grained sandy claystone; well sorted; firm; damp. | | | | | |
| | | | | | | | | | |
| | 80 | | | | | | | | |

Remarks

Logged by: T. Murphy & L. Pivonka

Checked by: *[Signature]*

Project No.

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Project: Rocky Flats Plant

LOG OF BORING NO. 34-86

Date Drilled 8/20/86, 8/26/86, 8/28/86

Coordinates N 37171.4 E 23088.4

Boring Method Hollow Stem Auger/NC Core

Ground Surface Elevation 5910.44'

| Elev. (feet) | Depth (feet) | Sample Type | Graphic Log | Material Description | Penetration Resistance (Blows/inch) | | Water Content (%) | | Other Tests |
|-----------------|-----------------|----------------|----------------|---|---|----|-------------------------|----|----------------|
| | | | | | 20 | 40 | 20 | 40 | |
| | 80 | | | 71.0-74.3'-Sample. Recovered 3.3/3.3'=100%. CLAYSTONE: dark gray (N 3); blocky texture; well sorted; firm; damp. | | | | | |
| | | | | 74.3-75.3'-Sample. Recovered 0.6/1.0'=60%. CLAYSTONE: dark gray (N 3); grayish orange (10YR 7/4) mottles; well sorted; consolidated; damp. | | | | | |
| | 85 | | | 75.3-78.5'-Sample. Recovered 3.2/3.2'=100%. SANDSTONE: medium gray (N 5) silty sandstone; well sorted; consolidated; damp. | | | | | |
| | | | | 78.5-83.5'-Sample. Recovered 5.0/5.0'=100%. CLAYSTONE: medium dark gray (N 4); blocky texture; well sorted; consolidated; damp. | | | | | |
| | 90 | | | 83.5-86.0'-Sample. Recovered 2.5/2.5'=100%. CLAYSTONE: medium dark gray (N 4); blocky texture; trace of pale yellowish orange (10YR 8/6) nodules; well sorted; consolidated; damp. | | | | | |
| | | | | 86.0-86.6'-Sample. Recovered 0.6/0.6'=100%. CLAYSTONE: medium dark gray (N 4); blocky texture; trace of pale yellowish orange (10YR 8/6) nodules; well sorted; consolidated; damp. | | | | | |
| | 95 | | | 86.6-89.0'-Sample. Recovered 2.4/2.4'=100%. CLAYSTONE: greenish gray (5GY 6/1) silty sandstone with clay laminae; well sorted; consolidated; damp. | | | | | |
| | 100 | | | | | | | | |

Remarks Logged by: T. Murphy & L. Pivonka

Checked by: JHP

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Project: Rocky Flats Plant

LOG OF BORING NO. 34-86

Date Drilled 8/20/86, 8/26/86, 8/28/86 Coordinates N 37171.4 E 23088.4

Boring Method Hollow Stem Auger/NC Core Ground Surface Elevation 5910.44'

| Elev. (feet) | Depth (feet) | Sample Type | Graphic Log | Material Description | Penetration Resistance (Blows/Inch) | | Water Content (%) | | Other Tests |
|-----------------|-----------------|----------------|----------------|--|---|----|-------------------------|----|----------------|
| | | | | | 20 | 40 | 20 | 40 | |
| | 100 | | | 96.0-100.0'-Sample. Recovered 4.0/4.0'=100%. CLAYSTONE: medium dark gray (N 4); gradational contact; some very fine- grained sand; well sorted; consolidated; damp. TOTAL DEPTH: 100.0' | | | | | |
| | 105 | | | | | | | | |
| | 110 | | | | | | | | |
| | 115 | | | | | | | | |
| | 120 | | | | | | | | |

Remarks Logged by:

Checked by: *[Signature]*

Project No.
106P06222

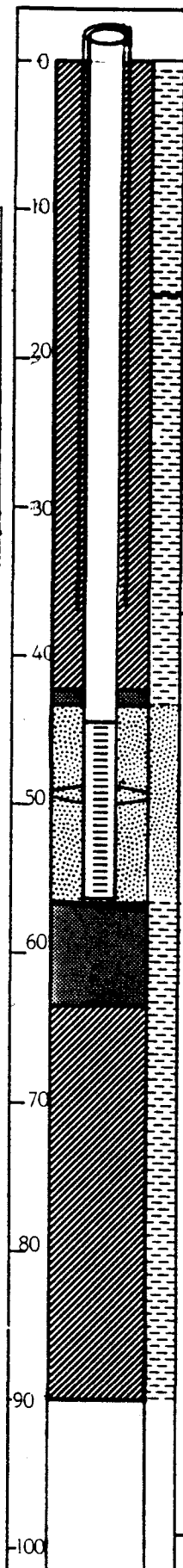
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PROJECT

Rocky Flats Plant



ELEVATION: GROUND LEVEL 5910.44'
TOP OF CASING 5912.78'

CONSTRUCTION TIME LOG:

| TASK | START | | FINISH | |
|---------------------|--------------|------|--------------|------|
| | DATE 1986 | TIME | DATE 1986 | TIME |
| DRILLING: | | | | |
| 7½" auger | 8/20 | 1251 | 8/20 | 1545 |
| 4 3/4" core | 8/26 | 1503 | 9/2 | 1202 |
| | | | | |
| GEOPHYS. LOGGING: | — | — | — | — |
| CASING: | | | | |
| 5" steel | 8/21 | 0800 | 8/21 | 1335 |
| 2" stainless | 9/3 | 0845 | 9/3 | 0900 |
| | | | | |
| FILTER PLACEMENT: | 9/3 | 0900 | 9/3 | 1145 |
| CEMENTING: | 9/2 | 1604 | 9/2 | 1716 |
| LEVELCPMENT: | 9/5 | 1000 | 9/12 | 1015 |
| OTHER: | | | | |
| Cementing 5" casing | 8/21 | 1359 | 8/21 | 1456 |
| Lower cement | 9/3 | 1150 | 9/3 | 1210 |
| Bentonite | 9/3 | 0823 | 9/3 | 0845 |
| | 9/3 | 1145 | 9/3 | 1150 |
| Packer test | 8/29 | 1056 | 8/29 | 1725 |

WELL DEVELOPMENT

See Well Development Summary Sheet

COMMENTS:

Water encountered at 48.0' during drilling.

Top of stainless steel casing: 2.34'

Cave from T.D. to 90.0'

[illegible]

HYDRO-SEARCH RENO•DENVER

CONSULTING HYDROLOGISTS-GEOLOGISTS



SHEET _____ of _____

CLIENT/SUBJECT _____ W.O. NO. _____

TASK DESCRIPTION _____ TASK NO. _____

| | | | |
|---------------------------|------------|---------------------|-----------------------|
| PREPARED BY _____ | DEPT _____ | DATE _____ | APPROVED BY _____ |
| MATH CHECK BY <u>JLP</u> | DEPT _____ | DATE <u>6/21/88</u> | |
| METHOD REV. BY <u>JLP</u> | DEPT _____ | DATE <u>6/21/88</u> | |
| | | | DEPT _____ DATE _____ |

WELL 34-86

Hydraulic Conductivity (cm/sec) = 3.1×10^{-6}

Flowrate (gpm) = 0.409

Screened Interval (ft below G.L.) = 44.24 - 56.25'

44.24 - 55.6 sandstone
55.6 - 56.25 claystone

Method of Analysis: Residual-drawdown Plot

(Driscoll, 1986 - pg 256.)



SHEET _____ of _____

CLIENT/SUBJECT _____ W.O. NO. _____

TASK DESCRIPTION _____ TASK NO. _____

| | | | |
|----------------------|------------|------------|---|
| PREPARED BY _____ | DEPT _____ | DATE _____ | APPROVED BY _____ DEPT _____ DATE _____ |
| MATH CHECK BY _____ | DEPT _____ | DATE _____ | |
| METHOD REV. BY _____ | DEPT _____ | DATE _____ | |

WELL 34-86

$$T \text{ (gpd/ft)} = \frac{264 Q}{\Delta S'} = \frac{(264) (409)}{137} = .788$$

$$\text{where } Q \text{ (gpm)} = 9 \text{ gallons} / 22 \text{ minutes} = 0.409 \text{ gpm}$$

$$\Delta S' = \text{change in residual drawdown / log cycle} \\ = 137 \text{ ft / log cycle (see attached plot)}$$

$$K \text{ (gpd/ft}^2\text{)} = T / b = .788 / 12.01 = 6.56 \times 10^{-2}$$

$$\text{where } b \text{ (ft)} = 12.01'$$

$$K \text{ (cm/sec)} = 6.56 \times 10^{-2} \text{ gpd/ft}^2 \times \frac{4.72 \times 10^{-5} \text{ cm/sec}}{\text{gpd/ft}^2} = 3.1 \times 10^{-6}$$

This method is valid where $u \leq 0.01$

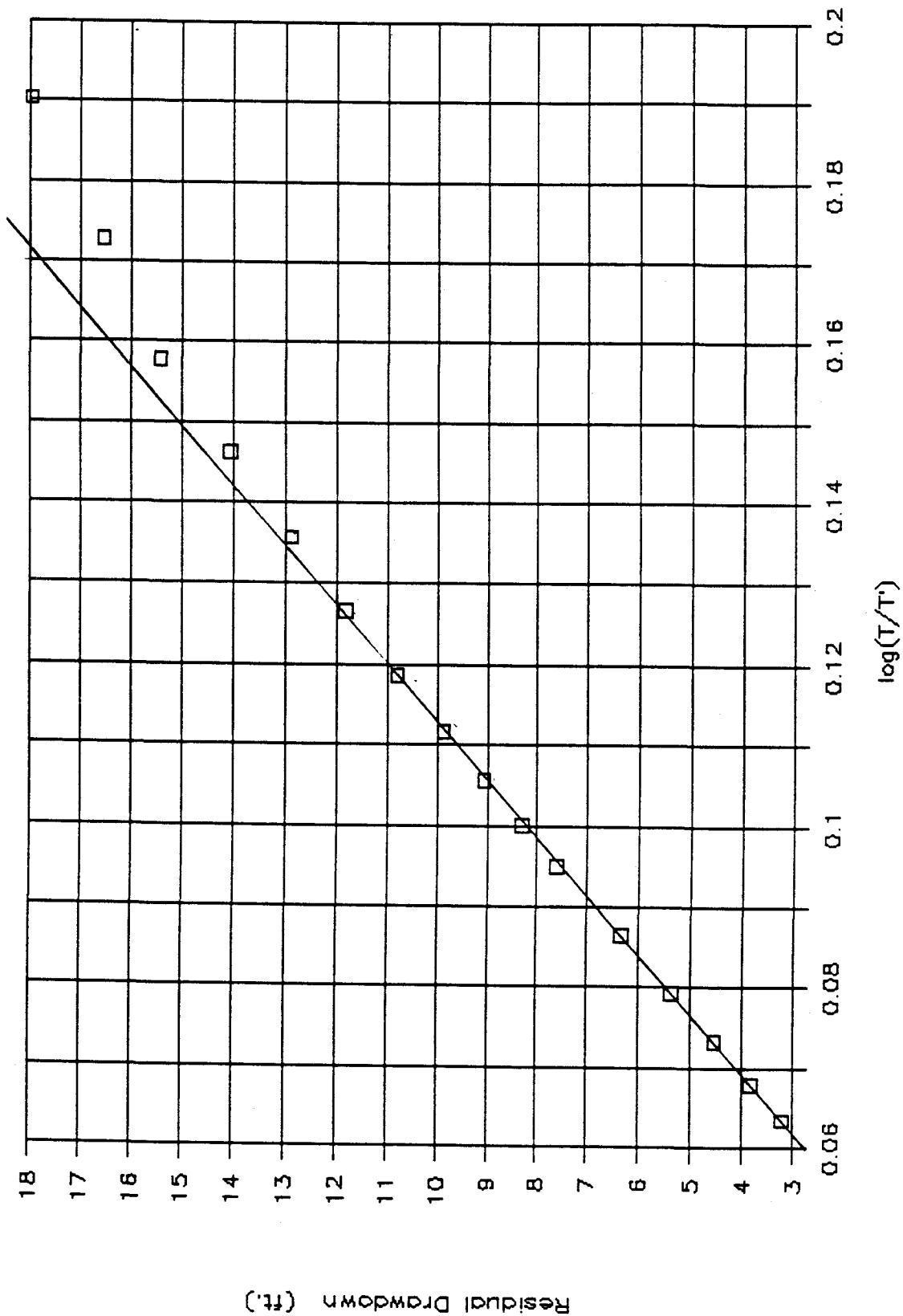
solving for t for $u \leq 0.01$.

$$t \text{ (min)} = \frac{r^2 S}{4 T u} = \frac{(0.198)^2 10^{-3}}{4 (.788) (.01)} \times \frac{1440 \text{ min}}{\text{day}} \times \frac{7.482 \text{ gal}}{\text{ft}^3} \\ = 13 \text{ minutes}$$

$$\text{where } r \text{ (ft)} = \left(\frac{4.75}{24} \right) \text{ ft} = (0.198) \text{ ft}$$

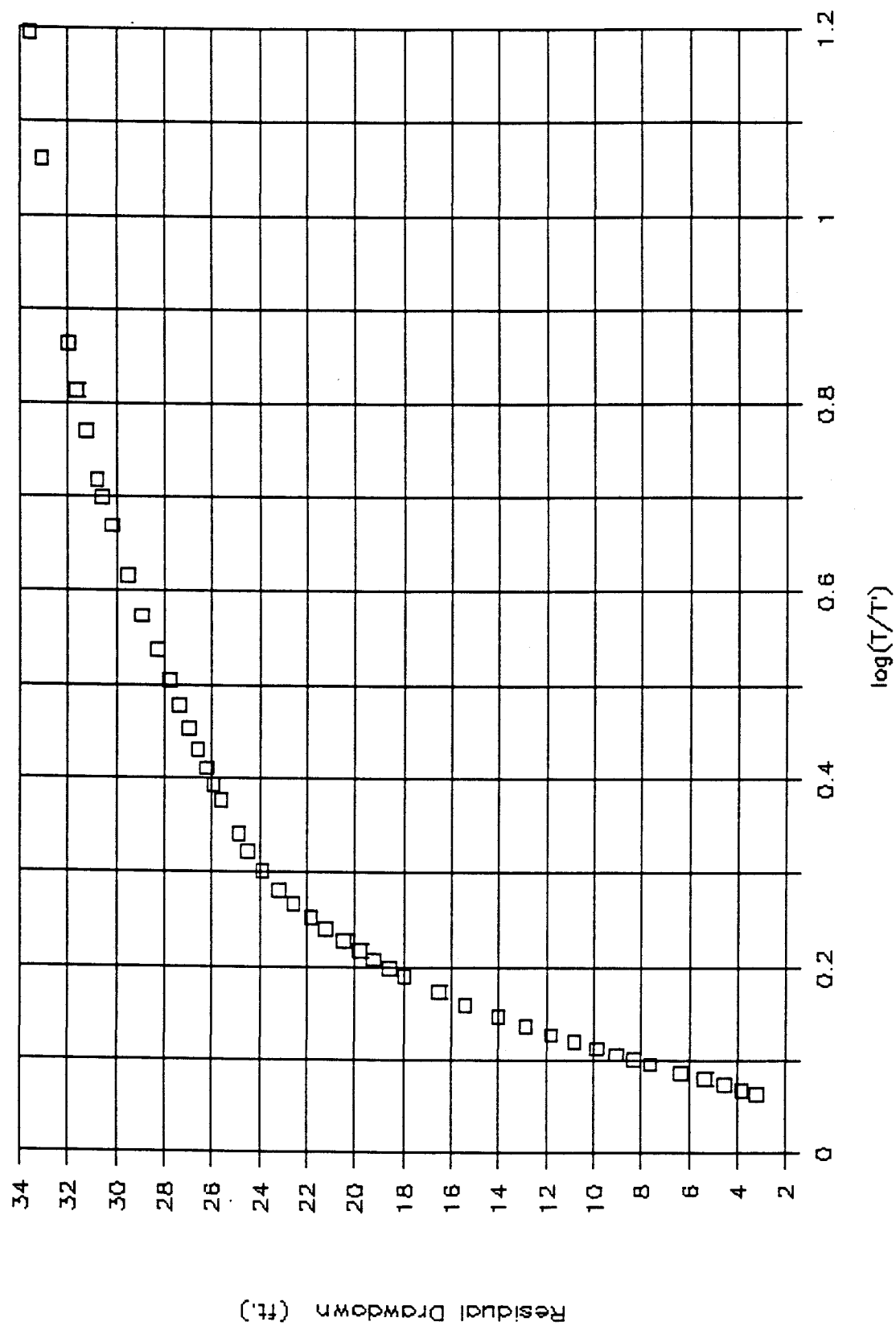
$S = 10^{-3}$ assumed S for confined aquifer
 $\Delta S'$ is based on points where $t \geq 70 \text{ min}$.

WELL 34-86

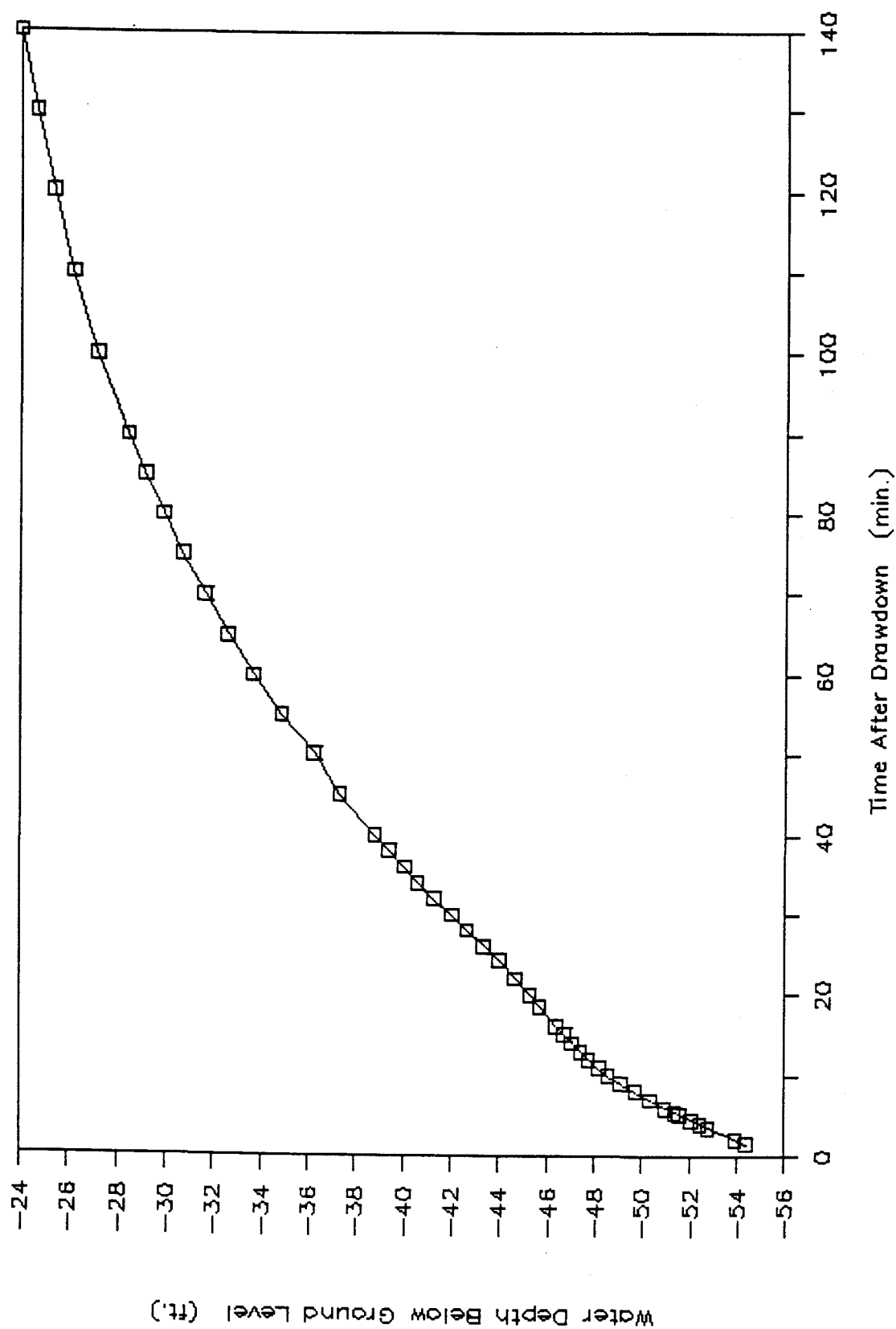


$$\Delta S' = \frac{18.0 - 3.0}{.1715 - .0617} = 137 \text{ ft} / \log \text{ cycle}$$

WELL 34-86



WELL 34-86



| WELL 34-86 | | | | |
|---------------------|-------------------------|-------------------------|-------------------------|-----------|
| T Time (min.) | T' T Prime (min.) | Water Level (ft.) | s' Rsd Drwn (ft.) | log(T/T') |
| 23.50 | 1.50 | 54.39 | 33.59 | 1.19 |
| 24.10 | 2.10 | 53.91 | 33.11 | 1.06 |
| 25.50 | 3.50 | 52.77 | 31.97 | 0.86 |
| 26.00 | 4.00 | 52.44 | 31.64 | 0.81 |
| 26.50 | 4.50 | 52.06 | 31.26 | 0.77 |
| 27.20 | 5.20 | 51.59 | 30.79 | 0.72 |
| 27.50 | 5.50 | 51.37 | 30.57 | 0.70 |
| 28.00 | 6.00 | 50.97 | 30.17 | 0.67 |
| 29.00 | 7.00 | 50.35 | 29.55 | 0.62 |
| 30.00 | 8.00 | 49.73 | 28.93 | 0.57 |
| 31.00 | 9.00 | 49.11 | 28.31 | 0.54 |
| 32.00 | 10.00 | 48.58 | 27.78 | 0.51 |
| 33.00 | 11.00 | 48.20 | 27.40 | 0.48 |
| 34.00 | 12.00 | 47.77 | 26.97 | 0.45 |
| 35.00 | 13.00 | 47.40 | 26.60 | 0.43 |
| 36.00 | 14.00 | 47.06 | 26.26 | 0.41 |
| 37.00 | 15.00 | 46.75 | 25.95 | 0.39 |
| 38.00 | 16.00 | 46.41 | 25.61 | 0.38 |
| 40.50 | 18.50 | 45.69 | 24.89 | 0.34 |
| 42.00 | 20.00 | 45.29 | 24.49 | 0.32 |
| 44.00 | 22.00 | 44.68 | 23.88 | 0.30 |
| 46.30 | 24.30 | 44.02 | 23.22 | 0.28 |
| 48.00 | 26.00 | 43.37 | 22.57 | 0.27 |
| 50.00 | 28.00 | 42.64 | 21.84 | 0.25 |
| 52.00 | 30.00 | 42.03 | 21.23 | 0.24 |
| 54.00 | 32.00 | 41.30 | 20.50 | 0.23 |
| 56.00 | 34.00 | 40.62 | 19.82 | 0.22 |
| 58.00 | 36.00 | 40.05 | 19.25 | 0.21 |
| 60.00 | 38.00 | 39.42 | 18.62 | 0.20 |
| 62.00 | 40.00 | 38.77 | 17.97 | 0.19 |
| 67.00 | 45.00 | 37.33 | 16.53 | 0.17 |
| 72.20 | 50.20 | 36.21 | 15.41 | 0.16 |
| 77.00 | 55.00 | 34.85 | 14.05 | 0.15 |
| 82.00 | 60.00 | 33.68 | 12.88 | 0.14 |
| 87.00 | 65.00 | 32.62 | 11.82 | 0.13 |
| 92.00 | 70.00 | 31.60 | 10.80 | 0.12 |
| 97.00 | 75.00 | 30.68 | 9.88 | 0.11 |
| 102.00 | 80.00 | 29.87 | 9.07 | 0.11 |
| 107.00 | 85.00 | 29.12 | 8.32 | 0.10 |
| 112.00 | 90.00 | 28.42 | 7.62 | 0.09 |
| 122.00 | 100.00 | 27.15 | 6.35 | 0.09 |
| 132.00 | 110.00 | 26.18 | 5.38 | 0.08 |
| 142.00 | 120.00 | 25.36 | 4.56 | 0.07 |
| 152.00 | 130.00 | 24.64 | 3.84 | 0.07 |
| 162.00 | 140.00 | 24.02 | 3.22 | 0.06 |

AQUIFER TEST DATA

WELL 34-86

PUMPING or OBSERVATION WELL

PUMPING or RECOVERY DATA

PAGE 1 OF 2

TYPE OF AQUIFER TEST BAILOUT - RECOVERY TEST

HOW Q MEASURED 4 1/2 GALLON BUCKET

HOW W.L.'s MEASURED OLYMPIC WELL SOUNDER

DEPTH OF PUMP/AIRPIPE BAILER

RAD./DIST. OF/FROM PUMPING WELL 0

PUMP ON: date 9-29-86 time 9:18

MEAS. POINT FOR W.L.'s N. Side of INNER CASING

PUMP OFF: date 9-29-86 time 9:40

ELEVATION OF MEAS. POINT

DURATION OF AQUIFER TEST 158.6 MIN

| TIME | | | | WATER LEVEL DATA | | | | | DISCHARGE | | RECORDED BY | COMMENTS |
|-------------------------|------------|-------|--------|----------------------------------|-------------------------|-------------|------------|--|-----------|---|-------------|------------------------------|
| t = <u>22</u> at t' = 0 | | | | STATIC WATER LEVEL <u>20.80'</u> | | | | | | | | |
| DAY | CLOCK TIME | t MIN | t' MIN | READING FT | CONVERSIONS CORRECTIONS | WATER LEVEL | s or s' FT | | READING | Q | | |
| 1 | 0831 | | | 20+3.15 | 2.35 | 20.80 | N/A | | | | DP | ORIGINAL W.L. |
| | 0918 | 0 | | 20+2.85 | " | 20.50 | 0.30 | | | | " | START BAILING |
| | 0921:20 | 3.3 | | | | | | | 2 gal | | " | Bailed 2 GAL |
| | 0925:15 | 7.25 | | | | | | | 2 gal | | " | Bailed 2 GAL |
| | 0930:05 | 12.1 | | | | | | | 2 gal | | " | Bailed 2 GAL |
| | 0936:35 | 18.6 | | | | | | | 2 gal | | " | Bailed 2 GAL |
| | 0940:00 | 22 | 0 | | | | | | 1 gal | | " | Bailed 1 GAL STOPPED BAILING |
| | 0941:30 | 23.5 | 1.5 | 55+1.79 | " | 54.39 | -33.59 | | | | " | 90% RECOVERED AT 24 |
| | 0942:04 | 24.1 | 2.1 | 55+1.26 | " | 53.91 | -33.11 | | | | " | |
| | 0942:34 | 24.6 | 2.6 | 55-0.01 | " | 52.64 | -31.84 | | | | " | |
| | 0943:00 | 25 | 3 | 55+0.46 | " | 53.11 | -32.31 | | | | " | |
| | 0943:30 | 25.5 | 3.5 | 55+0.12 | " | 52.77 | -31.90 | | | | " | |
| | 0944:00 | 26 | 4 | 55-0.21 | " | 52.44 | -31.64 | | | | " | |
| | 0944:30 | 26.5 | 4.5 | 50+4.41 | " | 52.06 | -31.26 | | | | " | |
| | 0945:00 | 27.2 | 5.2 | 50+3.94 | " | 51.59 | -30.79 | | | | " | |
| | 0945:33 | 27.5 | 5.5 | 50+3.72 | " | 51.37 | -30.57 | | | | " | |
| | 0946:00 | 28 | 6 | 50+3.32 | " | 50.97 | -30.17 | | | | " | |
| | 0947:00 | 29 | 7 | 50+2.70 | " | 50.35 | -29.55 | | | | " | |
| | 0948:00 | 30 | 8 | 50+2.08 | " | 49.73 | -28.93 | | | | " | |
| | 0949:00 | 31 | 9 | 50+1.46 | " | 49.11 | -28.31 | | | | " | |
| | 0950:00 | 32 | 10 | 50+0.93 | " | 48.58 | -27.78 | | | | " | |
| | 0951:00 | 33 | 11 | 50+0.55 | " | 48.20 | -27.40 | | | | " | |
| | 0952:00 | 34 | 12 | 50+0.12 | " | 47.77 | -26.97 | | | | " | |
| | 0953:00 | 35 | 13 | 45+0.75 | " | 47.40 | -26.60 | | | | " | |
| | 0954:00 | 36 | 14 | 45+0.41 | " | 47.06 | -26.26 | | | | " | |
| | 0955:00 | 37 | 15 | 45+0.10 | " | 46.75 | -25.95 | | | | " | |
| | 0956:00 | 38 | 16 | 45+3.76 | " | 46.41 | -25.61 | | | | " | |
| | 0958:30 | 40.5 | 18.5 | 45+3.04 | " | 45.69 | -24.89 | | | | " | |
| | 1000:00 | 42 | 20 | 45+2.69 | " | 45.29 | -24.49 | | | | " | |
| | 1002:00 | 44 | 22 | 45+2.03 | " | 44.68 | -23.88 | | | | " | |
| | 1004:15 | 46.5 | 24.25 | 45+1.37 | " | 44.02 | -23.22 | | | | " | |
| | 1006:00 | 48 | 26 | 45+0.72 | " | 43.37 | -22.57 | | | | " | |
| | 1008:00 | 50 | 28 | 45-0.01 | " | 42.64 | -21.84 | | | | " | |
| | 1010:00 | 52 | 30 | 40+4.38 | " | 42.03 | -21.23 | | | | " | |
| | 1012:00 | 54 | 32 | 40+3.65 | " | 41.30 | -20.50 | | | | " | |
| | 1014:00 | 56 | 34 | 40+2.97 | " | 40.62 | -19.82 | | | | " | |
| | 1016:00 | 58 | 36 | 40+2.40 | " | 40.05 | -19.25 | | | | " | |
| | 1018:00 | 60 | 38 | 40+1.77 | " | 39.42 | -18.62 | | | | " | |
| | 1020:00 | 62 | 40 | 40+1.12 | " | 38.77 | -17.97 | | | | " | |
| | 1025:00 | 67 | 45 | 35+4.68 | " | 37.33 | -16.53 | | | | " | |
| | 1030:12 | 72.2 | 50.2 | 35+3.56 | " | 36.21 | -15.41 | | | | " | |

HYDRO-SEARCH

RENO • DENVER

CONSULTING HYDROLOGISTS-GEOLOGISTS

LOCATION 2000 E. 113
 PERSONNEL 106706550
 PROJECT 9-29-86

AQUIFER TEST DATA

WELL 34-86
PUMPING or OBSERVATION WELL
PUMPING or RECOVERY DATA
PAGE 1 OF 2

TYPE OF AQUIFER TEST BAILOUT - RECOVERY TEST

HOW Q MEASURED 4 1/2 GALLON BUCKET

HOW W.L.'s MEASURED OLYMPIC WELL SOUNDER

RAD./DIST. OF/FROM PUMPING WELL 0

MEAS. POINT FOR W.L.'s N. SIDE of INNER CASING

ELEVATION OF MEAS. POINT ?

DEPTH OF PUMP/AIRPIPE Boiler

PUMP ON: date 9-29-86 time 9:18

PUMP OFF: date 9-29-86 time 9:40

DURATION OF AQUIFER TEST 158.6 MIN

| TIME | | | | WATER LEVEL DATA | | | | DISCHARGE | | RECORDED BY | COMMENTS |
|-------------------------|------------|-------|--------|----------------------------------|------------------------|-------------|---------|-----------|---|-------------|------------------------------|
| t = <u>22</u> at t' = 0 | | | | STATIC WATER LEVEL <u>20.80'</u> | | | | READING | Q | | |
| DAY | CLOCK TIME | t MIN | t' MIN | READING FT | CONVERSION CORRECTIONS | WATER LEVEL | s or s' | | | | |
| 1 | 0831 | | | 20+3.15 | 2.35 | 20.80 | N/A | | | DP | ORIGINAL W.L. |
| | 0918 | 0 | | 20+2.85 | " | 20.50 | 0.30 | | | " | START BAILING |
| | 0921:20 | 3.3 | | | | | | 2 gal | | " | Bailed 2 gal |
| | 0925:15 | 7.25 | | | | | | 2 gal | | " | Bailed 2 gal |
| | 0930:05 | 12.1 | | | | | | 2 gal | | " | Bailed 2 gal |
| | 0936:35 | 18.6 | | | | | | 2 gal | | " | Bailed 2 gal |
| | 0940:00 | 22 | 0 | | | | | 1 gal | | " | Bailed 1 gal STOPPED BAILING |
| | 0941:30 | 23.5 | 1.5 | 55+1.79 | " | 54.39 | -33.59 | | | " | 90% Recovered at 2' |
| | 0942:04 | 24.1 | 2.1 | 55+1.26 | " | 53.91 | -33.11 | | | " | |
| | 0942:34 | 24.6 | 2.6 | 55-0.01 | " | 52.64 | -31.84 | | | " | |
| | 0943:00 | 25 | 3 | 55+0.46 | " | 53.11 | -32.31 | | | " | |
| | 0943:30 | 25.5 | 3.5 | 55+0.12 | " | 52.77 | -31.90 | | | " | |
| | 0944:00 | 26 | 4 | 55-0.21 | " | 52.44 | -31.64 | | | " | |
| | 0944:30 | 26.5 | 4.5 | 50+1.41 | " | 52.06 | -31.26 | | | " | |
| | 0945:12 | 27.2 | 5.2 | 50+3.94 | " | 51.59 | -30.79 | | | " | |
| | 0945:33 | 27.5 | 5.5 | 50+3.72 | " | 51.37 | -30.57 | | | " | |
| | 0946:02 | 28 | 6 | 50+3.32 | " | 50.97 | -30.17 | | | " | |
| | 0947:00 | 29 | 7 | 50+2.70 | " | 50.35 | -29.55 | | | " | |
| | 0948 | 30 | 8 | 50+2.08 | " | 49.73 | -28.93 | | | " | |
| | 0949 | 31 | 9 | 50+1.46 | " | 49.11 | -28.31 | | | " | |
| | 0950 | 32 | 10 | 50+0.93 | " | 48.58 | -27.78 | | | " | |
| | 0951 | 33 | 11 | 50+0.55 | " | 48.20 | -27.40 | | | " | |
| | 0952 | 34 | 12 | 50+0.12 | " | 47.77 | -26.97 | | | " | |
| | 0953 | 35 | 13 | 45+4.75 | " | 47.40 | -26.60 | | | " | |
| | 0954 | 36 | 14 | 45+4.41 | " | 47.06 | -26.26 | | | " | |
| | 0955 | 37 | 15 | 45+4.10 | " | 46.75 | -25.95 | | | " | |
| | 0956 | 38 | 16 | 45+3.76 | " | 46.41 | -25.61 | | | " | |
| | 0958:30 | 40.5 | 18.5 | 45+3.04 | " | 45.69 | -24.89 | | | " | |
| | 1000 | 42 | 20 | 45+2.69 | " | 45.29 | -24.49 | | | " | |
| | 1002 | 44 | 22 | 45+2.03 | " | 44.68 | -23.88 | | | " | |
| | 1004:15 | 46.25 | 24.25 | 45+1.37 | " | 44.02 | -23.22 | | | " | |
| | 1006 | 48 | 26 | 45+0.72 | " | 43.37 | -22.57 | | | " | |
| | 1008 | 50 | 28 | 45-0.01 | " | 42.64 | -21.84 | | | " | |
| | 1010 | 52 | 30 | 40+4.38 | " | 42.03 | -21.23 | | | " | |
| | 1012 | 54 | 32 | 40+3.65 | " | 41.30 | -20.50 | | | " | |
| | 1014 | 56 | 34 | 40+2.97 | " | 40.62 | -19.82 | | | " | |
| | 1016 | 58 | 36 | 40+2.40 | " | 40.05 | -19.25 | | | " | |
| | 1018 | 60 | 38 | 40+1.77 | " | 39.42 | -18.62 | | | " | |
| | 1020 | 62 | 40 | 40+1.12 | " | 38.77 | -17.97 | | | " | |
| | 1025 | 67 | 45 | 35+4.68 | " | 37.33 | -16.53 | | | " | |
| | 1030:12 | 72.2 | 50.2 | 35+3.56 | " | 36.21 | -15.41 | | | " | |

LOCATION 7-29-86
PERSONNEL 106706222

PROJECT FL-13

PACKER TEST ANALYSIS
 WELL NO. 34-86
 ROCKY FLATS PLANT JOB NO. 106P06222
 DATE TESTED: 8/29/86 BY: L. PIVONKA
 TEST INTERVAL (FEET BELOW G.S.): 46.01 - 56.00
 MATERIAL TESTED: ARAPAHOE SANDSTONE
 DEPTH TO WATER (FEET BELOW G.S.): 20.46

$$K = \frac{Q}{2(\pi)(L)(H)} \ln\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00165170 (FEET³/MIN)
 L = LENGTH OF TEST INTERVAL = 9.99 FEET
 TEST INTERVAL IS BELOW WATER TABLE
 HEAD = DEPTH TO WATER + GAGE HEIGHT
 + GAGE PRESSURE (IN FEET)
 = 20.46 + 3.30 + 3.50 * 2.31 = 31.84
 R = BOREHOLE RADIUS = .16 FEET

 K = HYDRAULIC CONDUCTIVITY = .00000341 FT/MIN
 K = .00000173 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00000000 (FEET³/MIN)
 L = LENGTH OF TEST INTERVAL = 9.99 FEET
 TEST INTERVAL IS BELOW WATER TABLE
 HEAD = DEPTH TO WATER + GAGE HEIGHT
 + GAGE PRESSURE (IN FEET)
 = 20.46 + 3.30 + 10.00 * 2.31 = 46.86
 R = BOREHOLE RADIUS = .16 FEET

 K = HYDRAULIC CONDUCTIVITY = .00000000 FT/MIN
 K = .00000000 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00601109 (FEET³/MIN)
 L = LENGTH OF TEST INTERVAL = 9.99 FEET
 TEST INTERVAL IS BELOW WATER TABLE
 HEAD = DEPTH TO WATER + GAGE HEIGHT
 + GAGE PRESSURE (IN FEET)
 = 20.46 + 3.30 + 3.50 * 2.31 = 31.84
 R = BOREHOLE RADIUS = .16 FEET

 K = HYDRAULIC CONDUCTIVITY = .00001240 FT/MIN
 K = .00000630 CM/SEC

PACKER TEST ANALYSIS
 WELL NO. 34-86
 ROCKY FLATS PLANT JOB NO. 106P06222
 DATE TESTED: 8/29/86 BY: L. PIVONKA
 TEST INTERVAL (FEET BELOW G.S.): 55.01 - 65.00
 MATERIAL TESTED: ARAPAHOE CLAYSTONE
 DEPTH TO WATER (FEET BELOW G.S.): 20.46

$$K = \frac{Q}{2(\pi)(L)(H)} \ln\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00380432 (FEET³/MIN)
 L = LENGTH OF TEST INTERVAL = 9.99 FEET
 TEST INTERVAL IS BELOW WATER TABLE
 HEAD = DEPTH TO WATER + GAGE HEIGHT
 + GAGE PRESSURE (IN FEET)
 = 20.46 + 3.30 + 3.00 * 2.31 = 30.69
 R = BOREHOLE RADIUS = .16 FEET

 K = HYDRAULIC CONDUCTIVITY = .00000815 FT/MIN
 K = .00000414 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00902772 (FEET³/MIN)
 L = LENGTH OF TEST INTERVAL = 9.99 FEET
 TEST INTERVAL IS BELOW WATER TABLE
 HEAD = DEPTH TO WATER + GAGE HEIGHT
 + GAGE PRESSURE (IN FEET)
 = 20.46 + 3.30 + 12.50 * 2.31 = 52.63
 R = BOREHOLE RADIUS = .16 FEET

 K = HYDRAULIC CONDUCTIVITY = .00001127 FT/MIN
 K = .00000573 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00143508 (FEET³/MIN)
 L = LENGTH OF TEST INTERVAL = 9.99 FEET
 TEST INTERVAL IS BELOW WATER TABLE
 HEAD = DEPTH TO WATER + GAGE HEIGHT
 + GAGE PRESSURE (IN FEET)
 = 20.46 + 3.30 + 3.00 * 2.31 = 30.69
 R = BOREHOLE RADIUS = .16 FEET

 K = HYDRAULIC CONDUCTIVITY = .00000307 FT/MIN
 K = .00000156 CM/SEC

PACKER TEST ANALYSIS
 WELL NO. 34-86
 ROCKY FLATS PLANT JOB NO. 106P06222
 DATE TESTED: 8/29/86 BY: L. PIVONKA
 TEST INTERVAL (FEET BELOW G.S.): 76.71 - 86.70
 MATERIAL TESTED: ARAPAHOE CLAYSTONE
 DEPTH TO WATER (FEET BELOW G.S.): 20.46

$$K = \frac{Q}{2(\pi)(L)(H)} \ln\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00077169 (FEET³/MIN)
 L = LENGTH OF TEST INTERVAL = 9.99 FEET
 TEST INTERVAL IS BELOW WATER TABLE
 HEAD = DEPTH TO WATER + GAGE HEIGHT
 + GAGE PRESSURE (IN FEET)
 = 20.46 + 3.30 + 13.50 * 2.31 = 54.94
 R = BOREHOLE RADIUS = .16 FEET

 K = HYDRAULIC CONDUCTIVITY = .00000092 FT/MIN
 K = .00000047 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00000000 (FEET³/MIN)
 L = LENGTH OF TEST INTERVAL = 9.99 FEET
 TEST INTERVAL IS BELOW WATER TABLE
 HEAD = DEPTH TO WATER + GAGE HEIGHT
 + GAGE PRESSURE (IN FEET)
 = 20.46 + 3.30 + .00 * 2.31 = 23.76
 R = BOREHOLE RADIUS = .16 FEET

 K = HYDRAULIC CONDUCTIVITY = .00000000 FT/MIN
 K = .00000000 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00000000 (FEET³/MIN)
 L = LENGTH OF TEST INTERVAL = 9.99 FEET
 TEST INTERVAL IS BELOW WATER TABLE
 HEAD = DEPTH TO WATER + GAGE HEIGHT
 + GAGE PRESSURE (IN FEET)
 = 20.46 + 3.30 + .00 * 2.31 = 23.76
 R = BOREHOLE RADIUS = .16 FEET

 K = HYDRAULIC CONDUCTIVITY = .00000000 FT/MIN
 K = .00000000 CM/SEC

PACKER TEST ANALYSIS
 WELL NO. 34-86
 ROCKY FLATS PLANT JOB NO. 106P06222
 DATE TESTED: 8/29/86 BY: L. PIVONKA
 TEST INTERVAL (FEET BELOW G.S.): 85.10 - 95.09
 MATERIAL TESTED: ARAPAHOE CLAYSTONE
 DEPTH TO WATER (FEET BELOW G.S.): 20.46

$$K = \frac{Q}{2(PI)(L)(H)} \ln\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00054154 (FEET³/MIN)
 L = LENGTH OF TEST INTERVAL = 9.99 FEET
 TEST INTERVAL IS BELOW WATER TABLE
 HEAD = DEPTH TO WATER + GAGE HEIGHT
 + GAGE PRESSURE (IN FEET)
 = 20.46 + 2.80 + 4.00 * 2.31 = 32.50
 R = BOREHOLE RADIUS = .16 FEET

 K = HYDRAULIC CONDUCTIVITY = .00000109 FT/MIN
 K = .00000056 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00860736 (FEET³/MIN)
 L = LENGTH OF TEST INTERVAL = 9.99 FEET
 TEST INTERVAL IS BELOW WATER TABLE
 HEAD = DEPTH TO WATER + GAGE HEIGHT
 + GAGE PRESSURE (IN FEET)
 = 20.46 + 2.80 + 19.00 * 2.31 = 67.15
 R = BOREHOLE RADIUS = .16 FEET

 K = HYDRAULIC CONDUCTIVITY = .00000842 FT/MIN
 K = .00000428 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00000000 (FEET³/MIN)
 L = LENGTH OF TEST INTERVAL = 9.99 FEET
 TEST INTERVAL IS BELOW WATER TABLE
 HEAD = DEPTH TO WATER + GAGE HEIGHT
 + GAGE PRESSURE (IN FEET)
 = 20.46 + 2.80 + 4.00 * 2.31 = 32.50
 R = BOREHOLE RADIUS = .16 FEET

 K = HYDRAULIC CONDUCTIVITY = .00000000 FT/MIN
 K = .00000000 CM/SEC

ROCKY FLATS SOLAR PONDS
WATER LEVEL SUMMARY

| <u>WELL NUMBER</u> | <u>DATE</u> | <u>GROUND SURFACE ELEVATION</u> | <u>TOP OF CASING ELEVATION</u> | <u>STICK UP</u> | <u>DEPTH OF SI BASE</u> | <u>WATER DEPTH BELOW TOC</u> | <u>WATER SURFACE ELEVATION</u> |
|------------------------|-------------|---|--|---------------------|---------------------------------|--------------------------------------|--|
| 3486 | 09/05/86 | 5910.44 | 5912.78 | 2.34 | 56.25 | 22.38 | 5890.40 |
| | 09/08/86 | | | | | 22.40 | 5890.38 |
| | 09/09/86 | | | | | 22.63 | 5890.15 |
| | 09/10/86 | | | | | 22.77 | 5890.01 |
| | 09/11/86 | | | | | 23.48 | 5889.30 |
| | 09/12/86 | | | | | 24.25 | 5888.53 |
| | 10/13/86 | | | | | 22.96 | 5889.82 |
| | 11/26/86 | | | | | 22.77 | 5890.01 |
| | 01/01/87 | | | | | 22.38 | 5890.40 |
| | 02/01/87 | | | | | 22.17 | 5890.61 |
| | 03/17/87 | | | | | 22.05 | 5890.73 |
| | 05/08/87 | | | | | 21.98 | 5890.80 |
| | 06/02/87 | | | | | 22.80 | 5889.98 |
| | 07/07/87 | | | | | 21.65 | 5891.13 |
| | 07/27/87 | | | | | 22.10 | 5890.68 |
| | 08/04/87 | | | | | 22.40 | 5890.38 |
| | 09/01/87 | | | | | 22.20 | 5890.58 |
| | 09/29/87 | | | | | 22.40 | 5890.38 |
| | 11/03/87 | | | | | 23.50 | 5889.28 |
| | 12/01/87 | | | | | 22.26 | 5890.52 |
| | 12/21/87 | | | | | 23.30 | 5889.48 |
| | 01/11/88 | | | | | 22.10 | 5890.68 |
| | 02/29/88 | | | | | 22.00 | 5890.78 |
| | 03/21/88 | | | | | 22.00 | 5890.78 |
| | 04/18/88 | | | | | 21.90 | 5890.88 |

INDEX OF DATA

Boring No.: 35-86

Completed as well? Yes

Data in File

- ☒ Log of Borehole
- ☒ Well Construction Summaries
- ☐ Well Development Summaries
- ☒ Hydraulic Conductivity Test Data and Results
- ☐ Packer Test Data and Results
- ☒ Water Level Data
- ☐ Saturated Thickness Hydrographs

Project: Rocky Flats Plant

LOG OF BORING NO. 35-86

Date Drilled 8/19/86


Coordinates N 37177.0 E 23114.4

Boring Method Hollow Stem Auger

Ground Surface Elevation 5909.2

| Elev. (feet) | Depth (feet) | Sample Type | Graphic Log | Material Description | Penetration Resistance (Blows/Inch) | | Water Content (%) | | Other Tests |
|-----------------|-----------------|----------------|----------------|---|---|----|-------------------------|----|----------------|
| | | | | | 20 | 40 | 20 | 40 | |
| | 0 | | | VALLEY FILL ALLUVIUM | | | | | |
| | | | | 0-2.0'-Sample. Recovered 2.0/2.0'=100%. CLAY: olive gray (5Y 3/2); dark yellowish orange (10YR 6/6) mot- tles; grades downward into dark yellowish brown (10YR 4/2) clay; some silt; trace gravel and cobble size clasts of quartzite and granite; subangular to subrounded; dry to damp. | | | | | |
| | 5 | | | 2.0-2.7'-Sample. Recovered 0.7/0.7'=100%. CLAY: dark yellowish brown (10YR 4/2); dark yellowish orange (10YR 6/6) mottles common; some silt; trace gravel and cobble size clasts of quartzite and granite; subangular to subrounded; dry to damp. | | | | | |
| | 10 | | | 2.7-3.7'-Sample. Recovered 0.0/0.7'=0%. 3.7-5.7'-Sample. Recovered 2.0/2.0'=100%. 3.7-5.0'. CLAY: dark yellowish brown (10YR 4/2); dark yellowish orange (10YR 6/6) mottles common; some silt; trace gravel and cobble size clasts of quartzite and granite; subangular to subrounded; dry to damp. | | | | | |
| | 15 | | | 5.0-5.7'. CLAY: light olive gray (5Y 5/2); silty; well sorted; consolidated; firm; damp to moist. 5.7-6.5'. No sample. Depth correction. | | | | | |
| | 20 | | | 6.5-8.5'-Sample. Recovered 1.7/2.0'=85%. CLAY: olive black (5Y 2/1); silt; trace sand and gravel; moderately well sorted; soft; wet. | | | | | |

Remarks Logged by: T. Murphy

Checked by: 

Project No.

106P06222

Hydro-Search, Inc.

Page 1 of 2

Project: Rocky Flats Plant

LOG OF BORING NO. 35-86

Date Drilled 8/19/86

Coordinates N 37177.0 E 23114.4

Boring Method Hollow Stem Auger

Ground Surface Elevation 5909.2

| Elev. (feet) | Depth (feet) | Sample Type | Graphic Log | Material Description | Penetration Resistance (Blows/inch) | | Water Content (%) | | Other Tests |
|-----------------|-----------------|----------------|----------------|--|---|----|-------------------------|----|----------------|
| | | | | | 20 | 40 | 20 | 40 | |
| | 20 | | | 8.5-10.5'-Sample. Recovered 2.0/2.0'=100%. CLAY: olive black (5Y 2/1) to light olive gray (5Y 5/2); silty with gravel lenses; trace fine-grained sand; poorly sorted; subangular; firm; wet. | | | | | |
| | 25 | | | ARAPAHOE FORMATION | | | | | |
| | | | | 10.5-12.5'-Sample. Recovered 2.0/2.0'=100%. CLAY: light olive gray (5Y 5/2); dark yellowish orange (10YR 6/6) mottles; sand layer at 12.0-12.5'; fine-grained; silty; moist; firm. | | | | | |
| | 30 | | | 12.5-14.0'-Sample. Recovered 1.5/1.5'=100%. CLAYSTONE: light olive gray (5Y 5/2); dark yellowish orange (10YR 6/6) mottles; no gravel; silty; firm; moist. | | | | | |
| | | | | 14.0-16.0'-Sample. Recovered 2.0/2.0'=100%. CLAYSTONE: light olive gray (5Y 5/2); dark yellowish orange (10YR 6/6) mottles; no gravel; silty; layers of ironstone; firm; moist. | | | | | |
| | 35 | | | 16.0-18.0'-Sample. Recovered 1.8/2.0'=90%. CLAYSTONE: pale olive (10Y 6/2) to light olive gray (5Y 5/2); minor dark yellowish orange (10YR 6/6) mottling; apparent bedding due to color variations; firm; damp to moist. | | | | | |
| | 40 | | | TOTAL DEPTH: 18.0' | | | | | |

Remarks Logged by: T. Murphy

Checked by: *[Signature]*

Project No.
106P06222

Hydro-Search, Inc.

Page 2 of 2

WELL CONSTRUCTION SUMMARY

LOCATION or COORDS: _____

N 37177.0 E 23114.4

ELEVATION: GROUND LEVEL 5909.20'

TOP OF CASING 5911.54'

DRILLING SUMMARY:

TOTAL DEPTH Well: 11.60' Hole: 18.00'

BOREHOLE DIAMETER 7 1/4"

DRILLER Boyles Brothers Drilling Co.

15865 W. 5th Avenue

Golden, CO (Dave Jarvie)

RIG Mobile B-57

BIT(S) T5

DRILLING FLUID None

SURFACE CASING 5" x 5' steel w/ locking cap

WELL DESIGN:

BASIS: GEOLOGIC LOG X GEOPHYSICAL LOG _____

CASING STRING(S): C=CASING S=SCREEN

0.00' - 4.86' C1

4.86' - 11.60' S1

CASING: C1 2" I.D. Sch. 5 type 316 stain-
c2 less steel, threaded and flush
c3 jointed.

C4

SCREEN: S1 2" I.D. Sch. 5 type 316 stain-
s2 less steel, threaded and flush
s3 jointed, 0.010" wire wrap screen
s4 0.25' welded bottom cap.CENTRALIZERS Type 304 stainless steel
7.80' - 8.85'FILTER MATERIAL 16-40 silica sand
2.90' - 12.60'CEMENT Portland Type I
0.00' - 1.95'OTHER 3/8" bentonite pellets
1.95' - 2.90'
12.60' - 14.20'

CONSTRUCTION TIME LOG:

| TASK | START | | FINISH | |
|---------------------------|--------------|------|--------------|------|
| | DATE 1986 | TIME | DATE 1986 | TIME |
| DRILLING: 7 1/4" auger | 8/19 | 1258 | 8/19 | 1558 |
| GEOPHYS. LOGGING: | — | — | — | — |
| CASING: 2" stainless | 8/20 | 1012 | 8/20 | 1015 |
| FILTER PLACEMENT: | 8/20 | 1015 | 8/10 | 1020 |
| CEMENTING: | 8/20 | 1025 | 8/20 | 1040 |
| LEVELPMENT: | 9/3 | 1000 | 9/11 | 1155 |
| OTHER: Bentonite | 8/20 | 1020 | 8/20 | 1025 |
| | 8/20 | 1008 | 8/20 | 1012 |

WELL DEVELOPMENT

See Well Development Summary Sheet.

COMMENTS:

Water encountered at 8.0' during drilling.

Top of stainless steel casing: 2.34'

Cave from TD to 14.20'

LOCATION Golden, CO
PERSONNEL T. MurphyPROJECT 106P06222
Rocky Flats Plant



SHEET _____ of _____

CLIENT/SUBJECT _____ W.O. NO. _____

TASK DESCRIPTION _____ TASK NO. _____

PREPARED BY _____ DEPT _____ DATE _____

MATH CHECK BY _____ DEPT _____ DATE _____

METHOD REV. BY _____ DEPT _____ DATE _____

APPROVED BY

DEPT _____ DATE _____

WELL 35-86

Hydraulic Conductivity (cm/sec) = NA

Flowrate (gpm) =

Screened Interval (ft below G.L.) =

Method of Analysis: Residual-drawdown Plot

(Driscoll, 1986 - pg 256.)



SHEET ____ of ____

CLIENT/SUBJECT _____ W.O. NO. _____

TASK DESCRIPTION _____ TASK NO. _____

| | | | |
|----------------------|------------|------------|-------------------|
| PREPARED BY _____ | DEPT _____ | DATE _____ | APPROVED BY _____ |
| MATH CHECK BY _____ | DEPT _____ | DATE _____ | |
| METHOD REV. BY _____ | DEPT _____ | DATE _____ | |

WELL 35-86

$$T \text{ (gpd/ft)} = \frac{264 Q}{\Delta S'} = \frac{(264) (.25)}{17.5} = 3.77$$

where $Q \text{ (gpm)} = 1.5 \text{ gallons/6 minutes} = 0.25 \text{ gpm}$

$$\Delta S' = \text{ft. change in residual drawdown / log cycle}$$

$$= 17.5 \text{ ft/log cycle (see attached plot)}$$

$$K \text{ (gpd/ft}^2\text{)} = T/b = 3.77/6.74 = 0.559$$

where $b \text{ (ft)} = 6.74 \text{ ft}$

$$K \text{ (cm/sec)} = 0.559 \text{ gpd/ft}^2 \times \frac{4.72 \times 10^{-5} \text{ cm/sec}}{\text{gpd/ft}^2} = 2.6 \times 10^{-5}$$

This method is valid where $u = 0.01$

solving for t for $u = 0.01$.

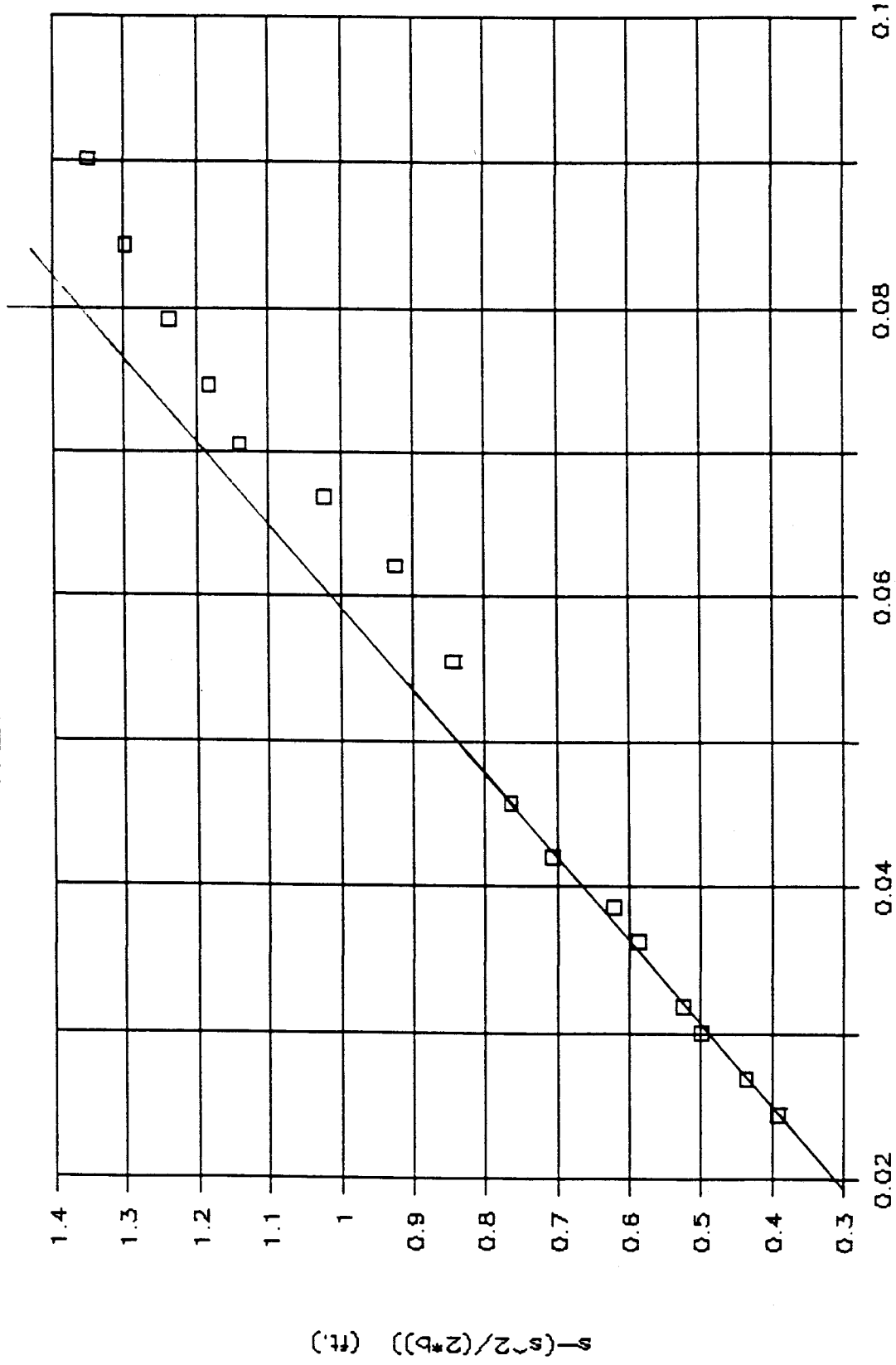
$$t \text{ (min)} = \frac{r^2 S}{4 T u} = \frac{(302)^2 \cdot 1}{4 (3.77) (0.01)} \times \frac{1440 \text{ min}}{\text{day}} \times \frac{7.482 \text{ gal}}{\text{ft}^3}$$

$$= 652 \text{ min.}$$

where $r \text{ (ft)} = \left(\frac{7.25}{24} \right) \text{ ft} = 6302 \text{ ft}$

$\Delta S'$ is invalid. $\beta =$ assumed S for confined aquifer

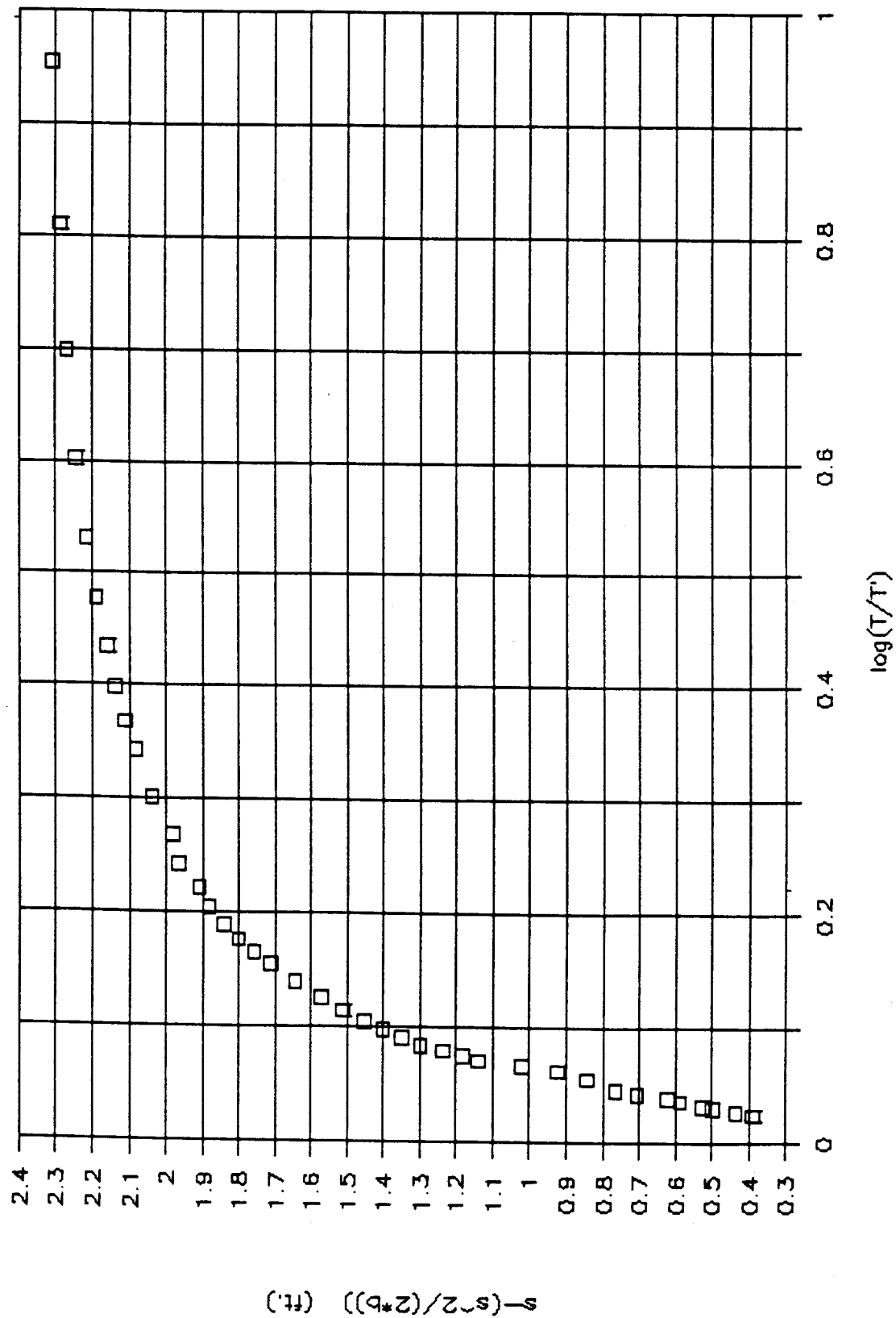
WELL 35-86



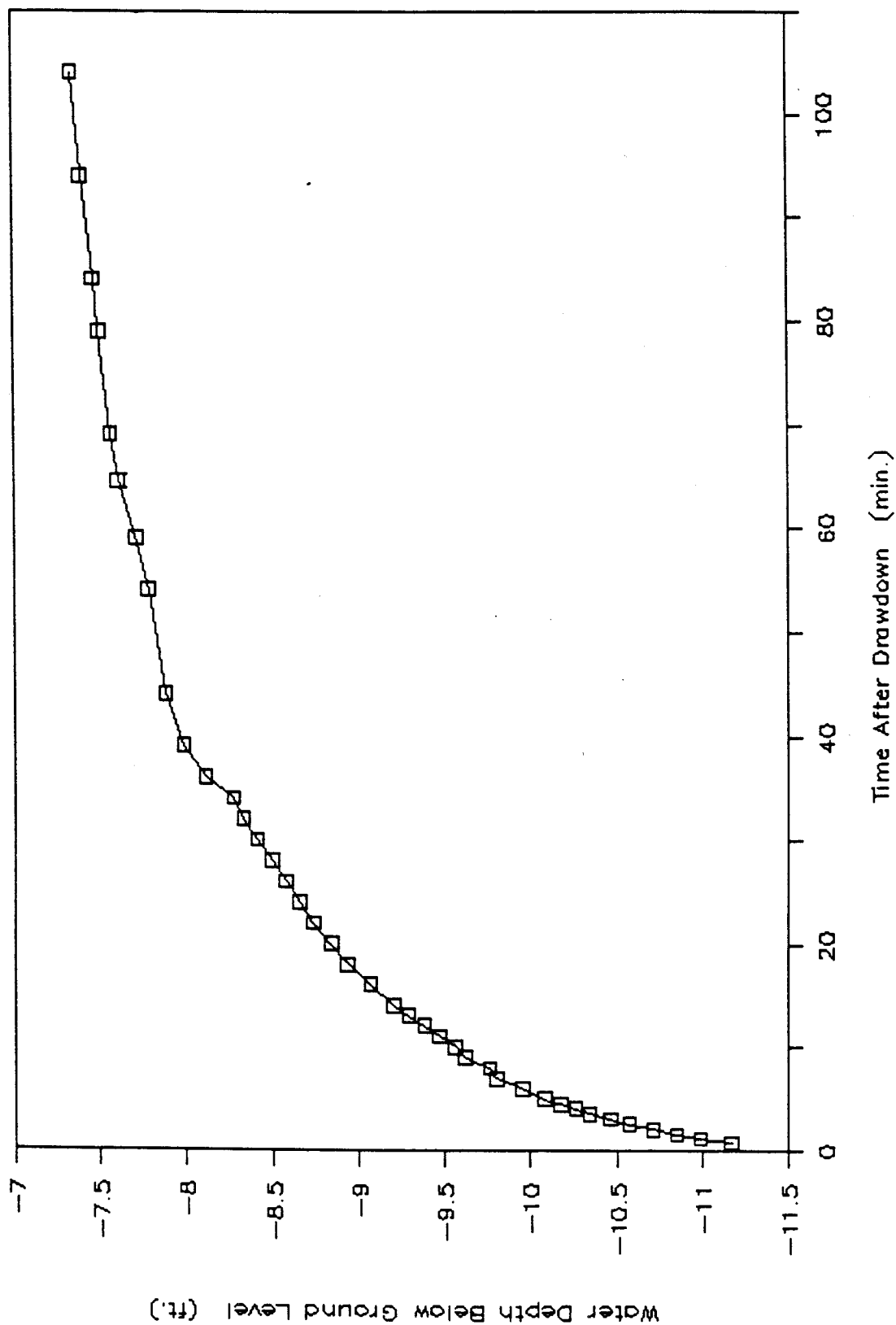
$\log(T/T')$

$$\Delta S' = \frac{(1.40 - 0.31) \text{ ft}}{0.0822 - 0.0200} = 17.5 \text{ ft/log cycle}$$

WELL 35-86



WELL 35-86



| WELL 35-86 | | | | | |
|---------------------|-------------------------|-------------------------|-------------------------|------------------------------------|-----------|
| T Time (min.) | T' T Prime (min.) | Water Level (ft.) | s Rsd Drwdn (ft.) | s-(s^2/2b) b=10.82 ft. (ft.) | log(T/T') |
| 6.75 | 0.75 | 11.17 | 4.23 | 2.31 | 0.95 |
| 7.10 | 1.10 | 10.99 | 4.05 | 2.29 | 0.81 |
| 7.50 | 1.50 | 10.85 | 3.91 | 2.27 | 0.70 |
| 8.00 | 2.00 | 10.71 | 3.77 | 2.25 | 0.60 |
| 8.50 | 2.50 | 10.57 | 3.63 | 2.22 | 0.53 |
| 9.00 | 3.00 | 10.46 | 3.52 | 2.19 | 0.48 |
| 9.50 | 3.50 | 10.34 | 3.40 | 2.16 | 0.43 |
| 10.00 | 4.00 | 10.26 | 3.32 | 2.14 | 0.40 |
| 10.50 | 4.50 | 10.17 | 3.23 | 2.11 | 0.37 |
| 11.00 | 5.00 | 10.08 | 3.14 | 2.08 | 0.34 |
| 12.00 | 6.00 | 9.95 | 3.01 | 2.04 | 0.30 |
| 13.00 | 7.00 | 9.80 | 2.86 | 1.98 | 0.27 |
| 14.00 | 8.00 | 9.76 | 2.82 | 1.97 | 0.24 |
| 15.00 | 9.00 | 9.62 | 2.68 | 1.91 | 0.22 |
| 16.00 | 10.00 | 9.56 | 2.62 | 1.88 | 0.20 |
| 17.00 | 11.00 | 9.47 | 2.53 | 1.84 | 0.19 |
| 18.00 | 12.00 | 9.38 | 2.44 | 1.80 | 0.18 |
| 19.00 | 13.00 | 9.29 | 2.35 | 1.76 | 0.16 |
| 20.00 | 14.00 | 9.20 | 2.26 | 1.71 | 0.15 |
| 22.00 | 16.00 | 9.07 | 2.13 | 1.64 | 0.14 |
| 24.00 | 18.00 | 8.94 | 2.00 | 1.57 | 0.12 |
| 26.00 | 20.00 | 8.84 | 1.90 | 1.51 | 0.11 |
| 28.00 | 22.00 | 8.74 | 1.80 | 1.45 | 0.10 |
| 30.00 | 24.00 | 8.66 | 1.72 | 1.40 | 0.10 |
| 32.00 | 26.00 | 8.58 | 1.64 | 1.35 | 0.09 |
| 34.00 | 28.00 | 8.50 | 1.56 | 1.30 | 0.08 |
| 36.00 | 30.00 | 8.41 | 1.47 | 1.24 | 0.08 |
| 38.00 | 32.00 | 8.33 | 1.39 | 1.18 | 0.07 |
| 40.00 | 34.00 | 8.27 | 1.33 | 1.14 | 0.07 |
| 42.00 | 36.00 | 8.11 | 1.17 | 1.02 | 0.07 |
| 45.00 | 39.00 | 7.98 | 1.04 | 0.92 | 0.06 |
| 50.00 | 44.00 | 7.88 | 0.94 | 0.85 | 0.06 |
| 60.00 | 54.00 | 7.78 | 0.84 | 0.76 | 0.05 |
| 65.00 | 59.00 | 7.71 | 0.77 | 0.71 | 0.04 |
| 70.50 | 64.50 | 7.61 | 0.67 | 0.62 | 0.04 |
| 75.00 | 69.00 | 7.57 | 0.63 | 0.59 | 0.04 |
| 85.00 | 79.00 | 7.50 | 0.56 | 0.53 | 0.03 |
| 90.00 | 84.00 | 7.47 | 0.53 | 0.50 | 0.03 |
| 100.00 | 94.00 | 7.40 | 0.46 | 0.44 | 0.03 |
| 110.00 | 104.00 | 7.35 | 0.41 | 0.39 | 0.02 |

AQUIFER TEST DATA

TYPE OF AQUIFER TEST Bail Down-Recovery
 HOW Q MEASURED 16 gallon bucket
 HOW W.L.'s MEASURED Olympic well sounder
 RAD./DIST. OF/FROM PUMPING WELL 0
 MEAS. POINT FOR W.L.'s inner casing
 ELEVATION OF MEAS. POINT _____

WELL 35-86
 PUMPING or OBSERVATION WELL
 PUMPING or RECOVERY DATA
 PAGE 1 OF 2

DEPTH OF PUMP/AIRPIPE _____
 PUMP ON: date _____ time _____
 PUMP OFF: date _____ time _____
 DURATION OF AQUIFER TEST _____

PROJECT Rocky Flats
 LOCATION Inside East Gate
 PERSONNEL G. Heist A. Pavlick
 DATE 9/25/86

| TIME | | | | WATER LEVEL DATA | | | | DISCHARGE | | RECORDED BY | COMMENTS |
|-------------------|------------|-------|-------|-------------------------|------------------------|-------------|---------|-----------|-------|-------------|------------------------------|
| t = 6.2 at t' = 0 | | | | STATIC WATER LEVEL 6.94 | | | | | | | |
| DAY | CLOCK TIME | (h:m) | (m:s) | READING | CONVERSION CORRECTIONS | WATER LEVEL | s or s' | READING | (gpm) | | |
| | 1255 | 0 | 0 | 5+4.25 | 2.3/slu | 6.94 | 0 | | | " | Begin bailing |
| | 1255:45 | 0 | 45 | | | | N/A | 1 | 1133 | " | Bail 1 gallon |
| | 1259:30 | 0 | 45 | | | | N/A | 0.5 | 0.67 | " | Bail 0.5 gallon |
| | 1301 | 0 | 0 | | | | | | | " | Stop bailing |
| | 1301:45 | 0 | 45 | 10+3.58 | " | 11.17 | 4.23 | | | " | T.O. of well = 11.1 |
| | 1302:05 | 0 | 45 | 10+3.30 | " | 10.99 | 4.05 | | | " | Reading at 1301 assumed = T. |
| | 1302:30 | 0 | 45 | 10+3.16 | " | 10.85 | 3.91 | | | | |
| | 1303:00 | 0 | 45 | 10+3.02 | " | 10.71 | 3.77 | | | | |
| | 1303:30 | 0 | 45 | 10+2.88 | " | 10.57 | 3.63 | | | | 2.31 = inner casing |
| | 1304:00 | 0 | 45 | 10+2.77 | " | 10.46 | 3.52 | | | | stick up |
| | 1304:30 | 0 | 45 | 10+2.65 | " | 10.34 | 3.40 | | | | |
| | 1305:00 | 0 | 45 | 10+2.57 | " | 10.26 | 3.32 | | | | |
| | 1305:30 | 0 | 45 | 10+2.48 | " | 10.17 | 3.23 | | | | 90% Recovery = 7. |
| | 1306:00 | 0 | 45 | 10+2.39 | " | 10.08 | 3.14 | | | | |
| | 1307:00 | 0 | 45 | 10+2.26 | " | 9.95 | 3.01 | | | | |
| | 1308:00 | 0 | 45 | 10+2.11 | " | 9.80 | 2.86 | | | | |
| | 1309:00 | 0 | 45 | 10+2.07 | " | 9.76 | 2.82 | | | | |
| | 1310:00 | 0 | 45 | 10+1.93 | " | 9.62 | 2.68 | | | | |
| | 1311:00 | 0 | 45 | 10+1.87 | " | 9.56 | 2.62 | | | | |
| | 1312:00 | 0 | 45 | 10+1.78 | " | 9.47 | 2.53 | | | | |
| | 1313:00 | 0 | 45 | 10+1.69 | " | 9.38 | 2.44 | | | | |
| | 1314:00 | 0 | 45 | 10+1.60 | " | 9.29 | 2.35 | | | | |
| | 1315:00 | 0 | 45 | 10+1.51 | " | 9.20 | 2.26 | | | | |
| | 1317:00 | 0 | 45 | 10+1.38 | " | 9.07 | 2.13 | | | | |
| | 1319:00 | 0 | 45 | 10+1.25 | " | 8.94 | 2.00 | | | | |
| | 1321:00 | 0 | 45 | 10+1.15 | " | 8.84 | 1.90 | | | | |
| | 1323:00 | 0 | 45 | 10+1.05 | " | 8.74 | 1.80 | | | | |
| | 1325:00 | 0 | 45 | 10+0.97 | " | 8.66 | 1.72 | | | | |
| | 1327:00 | 0 | 45 | 10+0.89 | " | 8.58 | 1.64 | | | | |
| | 1329:00 | 0 | 45 | 10+0.81 | " | 8.50 | 1.56 | | | | |
| | 1331:00 | 0 | 45 | 10+0.82 | " | 8.41 | 1.47 | | | | |
| | 1333:00 | 0 | 45 | 10+0.64 | " | 8.33 | 1.39 | | | | |
| | 1335:00 | 0 | 45 | 10+0.58 | " | 8.27 | 1.33 | | | | |
| | 1340:00 | 0 | 45 | 10+0.42 | " | 8.11 | 1.17 | | | | |
| | 1345:00 | 0 | 45 | 10+0.29 | " | 7.98 | 1.04 | | | | |
| | 1350:00 | 0 | 45 | 10+0.19 | " | 7.88 | 0.94 | | | | |
| | 1355:00 | 0 | 45 | 10+0.09 | " | 7.78 | 0.84 | | | | |
| | 1400:00 | 0 | 45 | 10+0.02 | " | 7.71 | 0.77 | | | | |
| | 1405:30 | 0 | 45 | 5+4.92 | " | 7.61 | 0.67 | | | | |
| | 1410:00 | 0 | 45 | 5+4.88 | " | 7.57 | 0.63 | | | | |

AQUIFER TEST DATA

TYPE OF AQUIFER TEST Bail Down - Recovery

HOW Q MEASURED _____

HOW W.L.'s MEASURED Olympic well sounder

RAD./DIST. OF/FROM PUMPING WELL

MEAS. POINT FOR W.L.'s N. side of inner casing

ELEVATION OF MEAS. POINT _____

WELL 35-86

PUMPING or OBSERVATION WELL

PUMPING or RECOVERY DATA

PAGE 2 OF 2

DEPTH OF PUMP/AIRPIPE _____

PUMP ON: date _____ time _____

PUMP OFF: date _____ time _____

DURATION OF AQUIFER TEST _____

[illegible]

| | |
|-----------|------------------------|
| LOCATION | Inside inner east gate |
| PERSONNEL | D. Pavlick w. Meyer |

PROJECT Rocky Flats
106 P06223

ROCKY FLATS SOLAR PONDS

WATER LEVEL SUMMARY

| <u>WELL NUMBER</u> | <u>DATE</u> | <u>GROUND SURFACE ELEVATION</u> | <u>TOP OF CASING ELEVATION</u> | <u>STICK UP</u> | <u>DEPTH OF SI BASE</u> | <u>WATER DEPTH BELOW TOC</u> | <u>WATER SURFACE ELEVATION</u> |
|------------------------|-------------|---|--|---------------------|---------------------------------|--------------------------------------|--|
| 3586 | 09/03/86 | 5909.20 | 5911.54 | 2.34 | 11.60 | 9.35 | 5902.19 |
| | 09/08/86 | | | | | 9.04 | 5902.50 |
| | 09/09/86 | | | | | 9.14 | 5902.40 |
| | 09/10/86 | | | | | 9.16 | 5902.38 |
| | 09/11/86 | | | | | 9.24 | 5902.30 |
| | 09/12/86 | | | | | 9.29 | 5902.25 |
| | 10/13/86 | | | | | 9.13 | 5902.41 |
| | 11/26/86 | | | | | 9.47 | 5902.07 |
| | 01/01/87 | | | | | 9.38 | 5902.16 |
| | 02/01/87 | | | | | 8.96 | 5902.58 |
| | 03/17/87 | | | | | 6.50 | 5905.04 |
| | 05/08/87 | | | | | 6.00 | 5905.54 |
| | 06/02/87 | | | | | 7.90 | 5903.64 |
| | 07/07/87 | | | | | 6.70 | 5904.84 |
| | 07/27/87 | | | | | 8.10 | 5903.44 |
| | 08/04/87 | | | | | 6.40 | 5905.14 |
| | 09/01/87 | | | | | 8.60 | 5902.94 |
| | 09/29/87 | | | | | 9.00 | 5902.54 |
| | 11/03/87 | | | | | 8.80 | 5902.74 |
| | 12/01/87 | | | | | 8.40 | 5903.14 |
| | 12/21/87 | | | | | 8.50 | 5903.04 |
| | 01/11/88 | | | | | 8.30 | 5903.24 |
| | 02/29/88 | | | | | 7.10 | 5904.44 |
| | 03/21/88 | | | | | 6.80 | 5904.74 |
| | 04/18/88 | | | | | 7.00 | 5904.54 |

INDEX OF DATA

Boring No.: 36-86

Completed as well? Yes

Data in File

- ☒ Log of Borehole
- ☒ Well Construction Summaries
- ☐ Well Development Summaries
- ☐ Hydraulic Conductivity Test Data and Results
- ☐ Packer Test Data and Results
- ☒ Water Level Data
- ☐ Saturated Thickness Hydrographs

Project: Rocky Flats Plant

LOG OF BORING NO. 36-86

Date Drilled 8/25/86

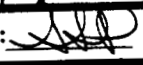
Coordinates N 37395.4 E 23715.3

Boring Method Hollow Stem Auger

Ground Surface Elevation 5881.94

| Elev. (feet) | Depth (feet) | Sample Type | Graphic Log | Material Description | Penetration Resistance (Blows/inch) | | Water Content (%) | | Other Tests |
|-----------------|-----------------|----------------|----------------|--|---|----|-------------------------|----|----------------|
| | | | | | 20 | 40 | 20 | 40 | |
| | 0 | | | VALLEY FILL ALLUVIUM 0-0.3'-Sample. Recovered 0.3/0.3'=100%. CLAY: moderate yellowish brown (10YR 5/4); silty; poorly sorted; unconsolidated; damp. 0.3-4.3'-Sample. Recovered 2.0/4.0'=50%. CLAY: light brown (5YR 5/6) and dark yellowish brown (10YR 4/2); silty; some granitic cobbles; trace iron concretions; poorly sorted; unconsolidated; damp. 4.3-5.5'-Sample. Recovered 0.9/1.2'=75%. GRAVEL: dark yellowish brown (10YR 4/2); granitic pebbles and cobbles; silty and clayey; trace iron concretions; poorly sorted; unconsolidated; damp. | | | | | |
| | 5 | | | | | | | | |
| | 10 | | | ARAPAHOE FORMATION 5.5-8.0'-Sample. Recovered 2.5/2.5'=100%. CLAYSTONE: medium light gray (N 6) and light olive gray (5Y 4/1); trace iron staining; weathered; consolidated; moist. 8.0-10.2'-Sample. Recovered 2.2/2.2'=100%. CLAYSTONE: dark yellowish orange (10YR 6/6); some medium light gray (N 6); sandy with 30-40% iron staining; consolidated; moist. | | | | | |
| | 15 | | | | | | | | |
| | 20 | | | TOTAL DEPTH: 10.2' | | | | | |

Remarks Logged by: L. Pivonka

Checked by: 

Project No.

106P06222

Hydro-Search, Inc.

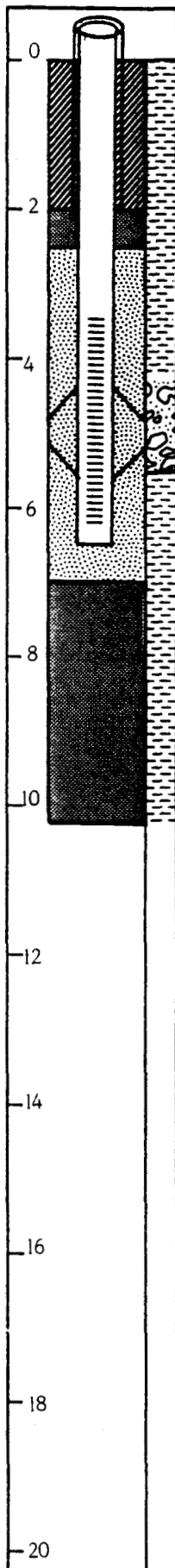
Page 1 of 1

WELL CONSTRUCTION SUMMARY

 LOCATION or COORDS: _____
 N 37395.4 E 23715.3

 ELEVATION: GROUND LEVEL 5881.94'
 TOP OF CASING 5883.78'

 LOCATION Golden, CO
 PERSONNEL L. Pivonka

 PROJECT 106P06222
 Rocky Flats Plant


DRILLING SUMMARY:

 TOTAL DEPTH Well: 6.50' Hole: 10.20'
 BOREHOLE DIAMETER 7 1/4"

 DRILLER Boyles Brothers Drilling Co.
 15865 W. 5th Avenue
 Golden, CO (Jim Horn)

 RIG Mobile B-57
 BIT(S) T-5

DRILLING FLUID None

SURFACE CASING 5" x 5' steel w/ locking cap

WELL DESIGN:

 BASIS: GEOLOGIC LOG ☒ GEOPHYSICAL LOG _____

CASING STRING(S): C=CASING S=SCREEN

| | | | | |
|-------|-------|----|--|--|
| 0.00' | 3.50' | C1 | | |
| 3.50' | 6.49' | S1 | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

CASING: C1 2" I.D. Sch. 5 type 316 stainless steel, threaded and flush jointed.

 SCREEN: S1 2" I.D. Sch. 5 type 316 stainless steel, threaded and flush jointed, 0.010" wire wrap screen
 0.25' welded bottom cap.

 CENTRALIZERS Type 304 stainless steel
 4.42' - 5.59'

 FILTER MATERIAL 32-42 silica sand
 2.50' - 7.00'

 CEMENT Portland Type I
 0.00' - 2.00'

 OTHER 3/8" bentonite pellets
 2.00' - 2.50'
 7.00' - 10.20'

CONSTRUCTION TIME LOG:

| TASK | START | | FINISH | |
|-------------------|-------|------|--------|------|
| | DATE | TIME | DATE | TIME |
| DRILLING: | 1986 | | 1986 | |
| 7 1/4" auger | 8/25 | 1014 | 8/25 | 1520 |
| | | | | |
| GEOPHYS. LOGGING: | — | — | — | — |
| CASING: | | | | |
| 2" stainless | 8/25 | 1523 | 8/25 | 1525 |
| | | | | |
| FILTER PLACEMENT: | 8/25 | 1525 | 8/25 | 1530 |
| CEMENTING: | 8/25 | 1533 | 8/25 | 1546 |
| DEVELOPMENT: | 8/27 | 1120 | 9/3 | 1055 |
| OTHER: | | | | |
| Bentonite | 8/25 | 1530 | 8/25 | 1533 |
| | 8/25 | 1520 | 8/25 | 1523 |
| | | | | |
| | | | | |
| | | | | |

WELL DEVELOPMENT

See Well Development Summary Sheet.

COMMENTS:

No water encountered during drilling.

Top of stainless steel casing: 1.84'

ROCKY FLATS SOLAR PONDS

WATER LEVEL SUMMARY

| <u>WELL</u> <u>NUMBER</u> | <u>DATE</u> | <u>GROUND</u> <u>SURFACE</u> <u>ELEVATION</u> | <u>TOP OF</u> <u>CASING</u> <u>ELEVATION</u> | <u>STICK</u> <u>UP</u> | <u>DEPTH</u> <u>OF SI</u> <u>BASE</u> | <u>WATER</u> <u>DEPTH</u> <u>BELOW TOC</u> | <u>WATER</u> <u>SURFACE</u> <u>ELEVATION</u> |
|------------------------------|-------------|---|--|---------------------------|---|--|--|
| 3686 | 08/27/86 | 5881.94 | 5883.78 | 1.84 | 6.49 | 9.28 | 5874.50 |
| | 09/03/86 | | | | | -1.00 | DRY |
| | 10/13/86 | | | | | -1.00 | DRY |
| | 11/26/86 | | | | | -1.00 | DRY |
| | 01/01/87 | | | | | 7.02 | 5876.76 |
| | 02/01/87 | | | | | 6.17 | 5877.61 |
| | 05/06/87 | | | | | 6.08 | 5877.70 |
| | 06/01/87 | | | | | 5.83 | 5877.95 |
| | 07/08/87 | | | | | 5.65 | 5878.13 |
| | 07/27/87 | | | | | 5.80 | 5877.98 |
| | 08/04/87 | | | | | 7.00 | 5876.78 |
| | 09/01/87 | | | | | 5.80 | 5877.98 |
| | 09/28/87 | | | | | 7.60 | 5876.18 |
| | 11/03/87 | | | | | 7.70 | 5876.08 |
| | 12/01/87 | | | | | 7.65 | 5876.13 |
| | 12/08/87 | | | | | 7.30 | 5876.48 |
| | 01/07/88 | | | | | 7.50 | 5876.28 |
| | 02/24/88 | | | | | 7.40 | 5876.38 |
| | 03/14/88 | | | | | 7.30 | 5876.48 |
| | 04/11/88 | | | | | 5.80 | 5877.98 |

APPENDIX B-2
1987 MONITOR WELLS

INDEX OF DATA

Boring No.: 21-87

Completed as well? Yes

Data in File

- ☒ Log of Borehole
- ☒ Well Construction Summaries
- ☒ Well Development Summaries
- ☐ Hydraulic Conductivity Test Data and Results
- ☐ Packer Test Data and Results
- ☒ Water Level Data
- ☐ Saturated Thickness Hydrographs

LOG OF BOREHOLE

Location Rocky Flats Plant; Mound Area
Coordinates N 36980.21 E 22693.84
Total Depth 17.00'

Drilling Company Boyles Bros
Date Drilled October 16, 1987
Drilling Method Hollow Stem Auger
Logged By K. D. Holliway
Geologist

Borehole/Well No. 21-87
Ground Surface Elevation 5927.58'
Water Level Encountered 7.0'
Static Dry
Driller R. Sharp
Helper T. Merritt
Drilling Fluid None
Checked By _____
Site Manager
CEARP Manager

Comments _____

| Depth Feet | Graphic Log | Sample Type | Lithologic Description | Samples Collected or Other Tests Performed |
|---------------|----------------|----------------|--|--|
| 0 | | | <u>COLLUVIUM</u> | |
| | | | <u>0.0-2.0' SAMPLE.</u> Recovered 1.9/2.0' = 95%. SANDY CLAY: dark yellowish brown (10 YR 4/2) to dusky yellowish brown (10 YR 2/2); quartzite cobbles, broken to subangular; sand very fine-grained; poorly sorted; unconsolidated; grass and roots to 0.2'; reactive to HCl; damp. | HNu Background=1.3 OVA Background=2.8 Alpha Background = 0.1 |
| 5 | | | <u>2.0-4.0' SAMPLE.</u> Recovered 1.0/2.0' = 50%. SANDY CLAY: same as above; damp. | <u>0.0-2.0':</u> Readings on core: HNu = 7.0; OVA = 3.2. |
| | | | <u>4.0-7.0' SAMPLE.</u> Recovered 0.3/3.0' = 10%. CLAY: light olive gray (5 Y 5/2); broken quartzite cobbles; trace very fine-grained sand; unconsolidated; damp. | <u>2.0-4.0':</u> Readings on core: HNu = 200; OVA = 3.6. |
| 10 | | | <u>7.0-9.5' SAMPLE.</u> Recovered 2.5/2.5' = 100%. 7.0-8.8': CLAY: light olive gray (5 Y 5/2); occasional subrounded quartzite pebbles; trace very fine-grained sand; some iron nodules; damp to moist. 8.8-9.5': SANDY CLAY: dusky yellowish brown (10 YR 2/2); very fine-grained sand; some organics; moist to wet. | <u>7.0-9.5':</u> Readings on core: HNu = 5.0; OVA = 3.8. |
| 15 | | | | |
| 20 | | | | |

LOG
OF
BOREHOLE

Location Rocky Flats Plant; Mound Area
Coordinates N 36980.21 E 22693.84
Total Depth 17.00'

Drilling Company Boyles Bros
Date Drilled October 16, 1987
Drilling Method Hollow Stem Auger
Logged By K. D. Holliway
Geologist

Borehole/Well No. 21-87
Ground Surface Elevation 5927.58'
Water Level Encountered 7.0'
Static Dry
Driller R. Sharp
Helper T. Merritt
Drilling Fluid None
Checked By _____
Site Manager
CEARP Manager

Comments _____

| Depth Feet | Graphic Log | Sample Type | Lithologic Description | Samples Collected or Other Tests Performed |
|---------------|----------------|----------------|--|---|
| | | | <u>9.5-12.0' SAMPLE.</u> Recovered 2.5/2.5' = 100%. 9.5-10.4': SANDY CLAY: light olive gray (5 Y 5/2); occasional subrounded to rounded quartzite pebbles; very fine-grained sand; trace caliche; damp to moist. | |
| | | | <u>ARAPAHOE FORMATION</u> | |
| | | | 10.4-12.0': SANDY CLAYSTONE: light olive gray (5 Y 5/2) to medium gray (N 5/0) with dark yellowish orange (10 YR 6/6) iron staining; very fine-grained sand; trace caliche; damp to moist. | |
| | | | <u>12.0-14.5' SAMPLE.</u> Recovered 2.5/2.5' = 100%. CLAYSTONE: same as above; damp to moist. | |
| | | | <u>14.5-17.0' SAMPLE.</u> Recovered 2.3/2.5' = 92%. CLAYSTONE: olive gray (5 Y 4/1) with trace dark yellowish orange (10 YR 6/6) iron staining; some very fine-grained sand more than above; trace caliche; damp to moist. | |
| | | | TOTAL DEPTH: 17.00' | |

WELL COMPLETION INFORMATION

Location Rocky Flats Plant: Mound Area

Coordinates N 36980.21 E 22693.84

Total Depth: Well 10.555'

Borehole 17.00'

Formation of Completion Rocky Flats Alluvium

Casing Material Sch 5, type 316 TFJ stainless steel

Screen Material 0.010" wire wrap, type 316 TFJ stainless steel

Date Installed Oct. 16, 1987

Installed By K. D. Holliway

Geologist

Well No. 21-87

Elevation: Ground Surface 5927.58'

Top of Casing 5929.36'

Casing Diameter 2" ID

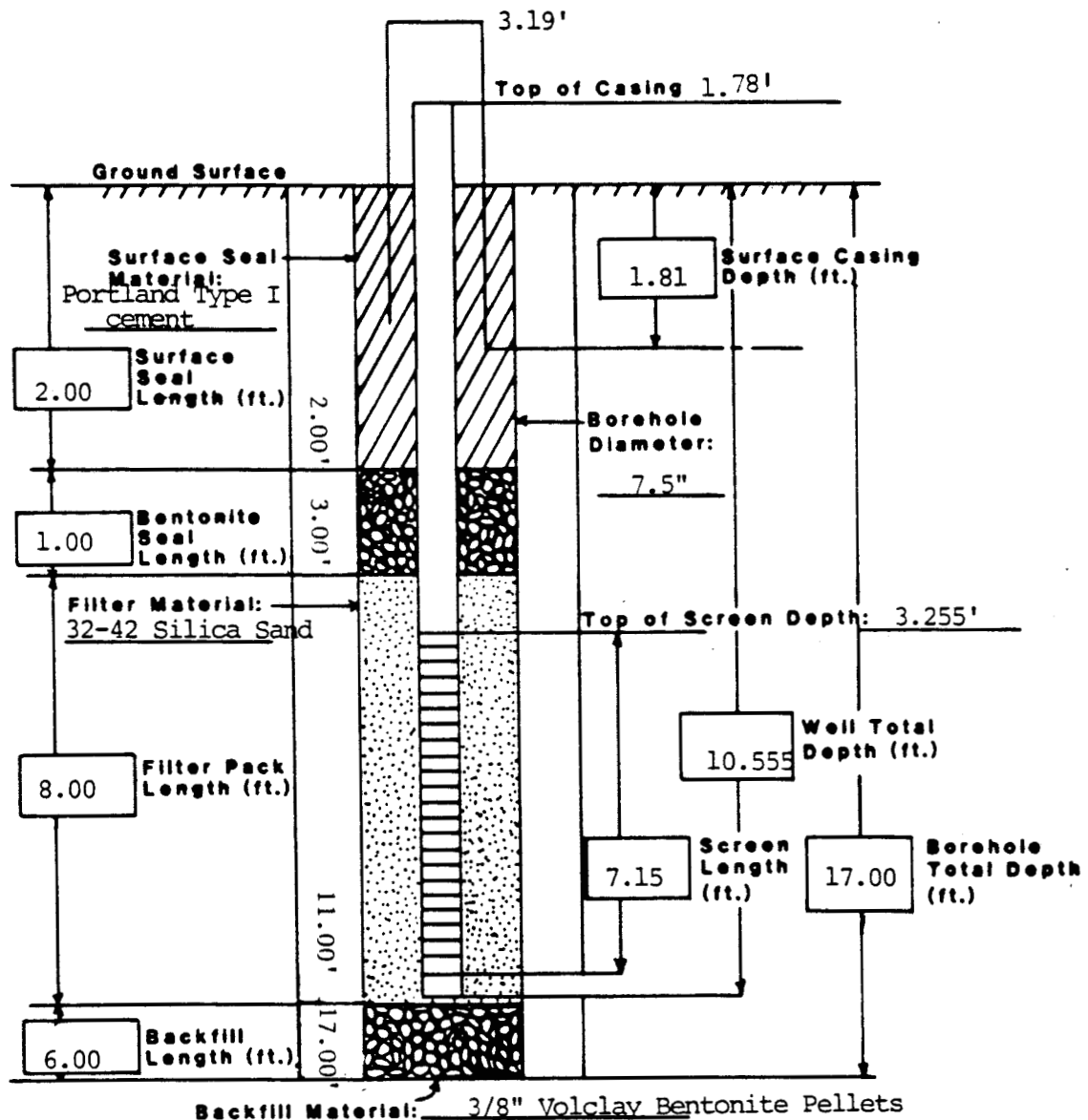
Surface Casing Diameter 5" ID

Approved By _____

Site Manager

CEARP Manager

Comments _____



Well No.: 21-87

WELL DEVELOPMENT SUMMARY SHEET

[illegible]

ROCKY FLATS SOLAR PONDS

WATER LEVEL SUMMARY

| <u>WELL</u> <u>NUMBER</u> | <u>DATE</u> | <u>GROUND</u> <u>SURFACE</u> <u>ELEVATION</u> | <u>TOP OF</u> <u>CASING</u> <u>ELEVATION</u> | <u>STICK</u> <u>UP</u> | <u>DEPTH</u> <u>OF SI</u> <u>BASE</u> | <u>WATER</u> <u>DEPTH</u> <u>BELOW TOC</u> | <u>WATER</u> <u>SURFACE</u> <u>ELEVATION</u> |
|------------------------------|-------------|---|--|---------------------------|---|--|--|
| 2187 | 11/12/87 | 5927.58 | 5929.36 | 1.78 | 10.40 | 7.30 | 5922.06 |
| | 12/01/87 | | | | | -1.00 | DRY |
| | 12/22/87 | | | | | 7.20 | 5922.16 |
| | 01/27/88 | | | | | 7.40 | 5921.96 |
| | 02/29/88 | | | | | 7.10 | 5922.26 |
| | 03/21/88 | | | | | 8.40 | 5920.96 |
| | 04/18/88 | | | | | 7.80 | 5921.56 |

INDEX OF DATA

Boring No.: 22-87BR

Completed as well? Yes

Data in File

- ☒ Log of Borehole
- ☒ Well Construction Summaries
- ☒ Well Development Summaries
- ☐ Hydraulic Conductivity Test Data and Results
- ☒ Packer Test Data and Results
- ☒ Water Level Data
- ☐ Saturated Thickness Hydrographs

LOG OF BOREHOLE

Location Rocky Flats Plant; Mound Area
Coordinates N 36934.99 E 22715.72
Total Depth 110.40'

Borehole/Well No. 22-87BR
Ground Surface Elevation 5930.70'
Water Level Encountered 12.2'
Stelle 5852.04' (12/01/87)

Drilling Company Boyles Bros
Date Drilled Sept 30 & Oct 7-8, 1987
Drilling Method Hollow Stem Auger; Rotary Core
Logged By K.D. Hollaway; J.B. Beroman
Geologist

Driller R. Sharp
Helper T. Merritt
Drilling Fluid 0.0 - 45.1' None;
45.1' - 110.4' Water
Checked By _____
Site Manager

CEARP Manager

Comments Surface casing set to 43.59' by K.D. Hollaway on October 2, 1987

| Depth Feet | Graphic Log | Sample Type | Lithologic Description | Samples Collected or Other Tests Performed |
|---------------|----------------|----------------|---|---|
| 0 | | | <u>COLLUVIUM</u> | HNu Background=0.6 OVA Background=1.2 |
| | | | <u>0.0-2.0' SAMPLE.</u> Recovered 2.0/2.0' = 100%. CLAYEY SAND: moderate yellowish brown (10 YR 4/2) to dusky yellowish brown (10 YR 2/2); subrounded to subangular quartzite cobbles and pebbles; sand fine-grained to coarse-grained; poorly sorted; calcareous; unconsolidated; some caliche; dry. | <u>0-2.0':</u> Readings on core: HNu = 1.0; OVA = 4.0. |
| 5 | | | <u>2.0-4.0' SAMPLE.</u> Recovered 1.5/2.0' = 75%. CLAYEY SAND: same as above; dry. | <u>2.0-4.0':</u> Readings on core: HNu = 4.0; OVA = 1.2. |
| | | | <u>4.0-6.0' SAMPLE.</u> Recovered 2.0/2.0' = 100%. CLAY: light olive gray (5 Y 5/2) to dusky yellowish brown (10 YR 2/2); trace subrounded quartzite cobbles; trace very fine-grained sand; trace caliche; damp. | <u>4.0-6.0':</u> Readings on core: HNu = Background; OVA = 1.6. |
| 10 | | | <u>6.0-8.0' SAMPLE.</u> Recovered 2.0/2.0' = 100%. CLAY: same as above except with dark yellowish orange (10 YR 6/6) iron staining and stringers of brownish gray (5 YR 4/1) claystone; damp. | <u>6.0-8.0':</u> Readings on core: HNu = 1.2; OVA = 10. |
| 15 | | | <u>8.0-10.2' SAMPLE.</u> Recovered 2.2/2.2' = 100%. CLAY: light olive brown (5 Y 5/6) to light olive gray (5 Y 5/2); some iron staining; some sand; trace caliche; damp. | <u>8.0':</u> Readings in augers: OVA = 100.0; HNu = 1.2. <u>8.0-10.2':</u> Readings in core: HNu = Background; OVA = 2.0. |
| 20 | | | | <u>10.2-12.2':</u> Readings on core: HNu = 2.0; OVA = 20. |

LOG
OF
BOREHOLE

Location Rocky Flats Plant; Mound Area
Coordinates N 36934.99 E 22715.72
Total Depth 110.40'

Borehole/Well No. 22-87BR
Ground Surface Elevation 5930.70'
Water Level Encountered 12.2'
Static 5852.04' (12/01/87)

Drilling Company Boyles Bros
Date Drilled Sept 30 & Oct 7-8, 1987
Drilling Method Hollow Stem Auger; Rotary Core
Logged By K.D. Holliway; J.B. Beraman
Geologist

Driller R. Sharp
Helper T. Merritt
Drilling Fluid 0.0 - 45.1' None;
45.1' - 110.4' Water
Checked By _____
Site Manager

CEARP Manager

Comments Surface casing set to 43.59' by K.D. Holliway on October 2, 1987

| Depth Feet | Graphic Log | Sample Type | Lithologic Description | Samples Collected or Other Tests Performed |
|---------------|----------------|----------------|---|---|
| 20 | | | <u>10.2-12.2' SAMPLE.</u> Recovered 2.0/2.0' = 100%. CLAY: light olive gray (5 Y 5/2); some very fine-grained sand stained dark yellowish orange (10 YR 6/6); subrounded quartzite cobbles; some iron staining; trace caliche; damp. | <u>12.2-26.5':</u> No readings above background on the core. |
| 25 | | | <u>12.2-14.2' SAMPLE.</u> Recovered 2.0/2.0' = 100%. 12.2-12.8': SANDY CLAY: same as above; moist to wet. | <u>26.5-27.5':</u> Readings on core: HNu = Back- ground; OVA = 1.6. |
| | | | <u>ARAPAHOE FORMATION</u> | |
| 30 | | | 12.8-14.2': SANDY CLAYSTONE: same as above except no quartzite cobbles; moist to wet. | <u>28.5-29.5':</u> Readings on core: HNu = 2.0; OVA = 1.0. |
| | | | <u>14.2-16.2' SAMPLE.</u> Recovered 2.0/2.0' = 100%. CLAYSTONE: light olive gray (5 Y 5/2); some very fine-grained sand; some dusky yellow (5 Y 6/4); trace caliche; damp to moist. | |
| 35 | | | <u>16.2-18.2' SAMPLE:</u> Recovered 2.0/2.0' = 100%. CLAYSTONE: olive gray (5 Y 4/1); occa- sional dark yellowish orange (10 YR 6/6) iron staining; trace very fine-grained sand; trace caliche; damp. | |
| | | | <u>18.2-20.2' SAMPLE.</u> Recovered 2.0/2.0' = 100%. CLAYSTONE: same as above; damp. | |
| 40 | | | | |

LOG OF BOREHOLE

Location Rocky Flats Plant; Mound Area
Coordinates N 36934.99 E 22715.72
Total Depth 110.40'

Borehole/Well No. 22-87BR
Ground Surface Elevation 5930.70'
Water Level Encountered 12.2'
Static 5852.04' (12/01/87)

Drilling Company Boyles Bros
Date Drilled Sept 30 & Oct 7-8, 1987
Drilling Method Hollow Stem Auger; Rotary Core
Logged By K.D. Holliway; J.B. Bergman
Geologist

Driller R. Sharo
Helper T. Merritt
Drilling Fluid 0.0 - 45.1' None;
45.1' - 110.4' Water
Checked By _____
Site Manager

CEARP Manager

Comments Surface casing set to 43.59' by K.D. Holliway on October 2, 1987

| Depth Feet | Graphic Log | Sample Type | Lithologic Description | Samples Collected or Other Tests Performed |
|---------------|----------------|----------------|--|--|
| 40 | | | <u>20.2-22.2' SAMPLE.</u> Recovered 2.0/2.0' = 100%. CLAYSTONE: same as above; damp. Hole readjusted to 22.50'. | |
| 45 | | | <u>22.5-23.5' SAMPLE.</u> Recovered 1.5/1.0' = 150%. CLAYSTONE: same as above except light olive gray (5 Y 5/2) with trace dark yellowish orange (10 YR 6/6) iron staining; no caliche; dry. | <u>45.60-52.55':</u> Packer Test Interval #7. |
| 50 | | | <u>23.5-24.5' SAMPLE.</u> Recovered 1.0/1.0' = 100%. CLAYSTONE: same as above except no iron staining; homogenous; dry to slightly damp. | |
| 55 | | | <u>24.5-25.5' SAMPLE.</u> Recovered 1.4/1.0' = 140%. CLAYSTONE: same as above; dry to slightly damp. | <u>52.55-62.20':</u> Packer Test Interval #6. |
| | | | <u>25.5-26.5' SAMPLE.</u> Recovered 1.4/1.0' = 140%. CLAYSTONE: light olive gray (5 Y 5/2) with trace dark yellowish orange (10 YR 6/6) iron staining in small fractures; trace very fine-grained sand; trace silt; damp to dry. | |
| 60 | | | <u>26.5-27.5' SAMPLE.</u> Recovered 1.2/1.0' = 120%. CLAYSTONE: same as above; damp. | |

LOG OF BOREHOLE

Location Rocky Flats Plant; Mound Area
Coordinates N 36934.99 E 22715.72
Total Depth 110.40'

Borehole/Well No. 22-87BR
Ground Surface Elevation 5930.70'
Water Level Encountered 12.2'
Static 5852.04' (12/01/87)

Drilling Company Boyles Bros
Date Drilled Sept 30 & Oct 7-8, 1987
Drilling Method Hollow Stem Auger; Rotary Core
Logged By K.D. Holliway; J.B. Beraman
Geologist

Driller R. Sharp
Helper T. Merritt
Drilling Fluid 0.0 - 45.1' None;
45.1' - 110.4' Water
Checked By _____
Site Manager

CEARP Manager

Comments Surface casing set to 43.59' by K.D. Holliway on October 2, 1987

| Depth Feet | Graphic Log | Sample Type | Lithologic Description | Samples Collected or Other Tests Performed |
|---------------|----------------|----------------|--|---|
| 60 | | | <p><u>27.5-28.5' SAMPLE.</u> Recovered 1.5/1.0' = 150%. CLAYSTONE: same as above; damp to moist.</p> <p><u>28.5-29.5' SAMPLE.</u> Recovered 1.5/1.0' = 150%. CLAYSTONE: same as above except more iron staining; damp.</p> <p><u>29.5-30.5' SAMPLE.</u> Recovered 1.5/1.0' = 150%. CLAYSTONE: same as above; trace organics; damp.</p> <p><u>30.5-31.5' SAMPLE.</u> Recovered 1.5/1.0' = 150%. SANDY CLAYSTONE: light olive gray (5 Y 5/2) with dark yellowish orange (10 YR 6/6) iron staining and grayish orange (10 YR 7/4) very fine-grained interbedded sands; occasional limonite nodules; some silt; some organics; dry.</p> <p><u>31.5-32.5' SAMPLE.</u> Recovered 1.0/1.0' = 100%. SANDY CLAYSTONE: olive black (5 Y 2/1) to light olive gray (5 Y 5/2); limonite nodules and iron staining moderate brown (5 YR 4/4); very fine-grained interbedded sands, grayish orange (10 YR 7/4); some silt; trace organics; dry.</p> | <p><u>62.20-71.85':</u> Packer Test Interval #5.</p> <p><u>71.85-81.50':</u> Packer Test Interval #4.</p> |
| 65 | | | | |
| 70 | | | | |
| 75 | | | | |
| 80 | | | | |

LOG OF BOREHOLE

Location Rocky Flats Plant; Mound Area
Coordinates N 36934.99 E 22715.72
Total Depth 110.40'

Borehole/Well No. 22-87BR
Ground Surface Elevation 5930.70'
Water Level Encountered 12.2'
Static 5852.04' (12/01/87)

Drilling Company Boyles Bros
Date Drilled Sept 30 & Oct 7-8, 1987
Drilling Method Hollow Stem Auger; Rotary Core
Logged By K.D. Holliway; J.B. Bergman
Geologist

Driller R. Sharp
Helper T. Merritt
Drilling Fluid 0.0 - 45.1' None;
45.1' - 110.4' Water
Checked By _____
Site Manager

CEARP Manager

Comments Surface casing set to 43.59' by K.D. Holliway on October 2, 1987

| Depth Feet | Graphic Log | Sample Type | Lithologic Description | Samples Collected or Other Tests Performed |
|---------------|----------------|----------------|--|--|
| 80 | | | <p><u>32.5-33.5' SAMPLE.</u> Recovered 1.2/1.0' = 120%. CLAYSTONE: same as above except no interbedded sands; no nodules; less sand; dry.</p> <p><u>33.5-34.5' SAMPLE.</u> Recovered 1.5/1.0' = 150%. CLAYSTONE: light olive gray (5 Y 5/2) to olive black (5 Y 2/1) with some moderate yellowish brown iron staining (10 YR 5/4); some very fine-grained sand; some silt; some organics; brittle; dry.</p> <p><u>34.5-35.5' SAMPLE.</u> Recovered 1.0/1.0' = 100%. CLAYSTONE: same as above; dry.</p> <p><u>35.5-36.5' SAMPLE.</u> Recovered 1.5/1.0' = 150%. CLAYSTONE: olive black (5 Y 2/1) to grayish black (N 2/0); some very fine-grained sand; some silt; some organics; trace limonite nodules; dry. Weathered/unweathered contact = 36.0'.</p> <p><u>36.5-37.5' SAMPLE.</u> Recovered 2.0/1.0' = 200%. CLAYSTONE: olive black (5 Y 2/1); some very fine-grained sand in fractures with dark yellowish orange (10 YR 6/6) iron staining; some organics; dry to slightly damp.</p> | <p><u>81.50-91.15':</u> Packer Test Interval #3.</p> <p><u>82.70-92.35':</u> Packer Test Interval #2.</p> <p><u>92.35-102.0':</u> Packer Test Interval #1.</p> |
| 85 | | | | |
| 90 | | | | |
| 95 | | | | |
| 100 | | | | |

LOG OF BOREHOLE

Location Rocky Flats Plant; Mound Area
Coordinates N 36934.99 E 22715.72
Total Depth 110.40'

Borehole Well No. 22-87BR
Ground Surface Elevation 5930.70'
Water Level Encountered 12.2'
Static 5852.04' (12/01/87)

Drilling Company Boyles Bros
Date Drilled Sept 30 & Oct 7-8, 1987
Drilling Method Hollow Stem Auger; Rotary Core
Logged By K.D. Holliway; J.B. Beroman
Geologist

Driller R. Sharp
Helper T. Merritt
Drilling Fluid 0.0 - 45.1' None;
45.1' - 110.4' Water
Checked By _____
Site Manager

CEARP Manager

Comments Surface casing set to 43.59' by K.D. Holliway on October 2, 1987

| Depth Feet | Graphic Log | Sample Type | Lithologic Description | Samples Collected or Other Tests Performed |
|---------------|----------------|----------------|---|---|
| 100 | | | <p><u>37.5-38.5' SAMPLE.</u> Recovered 1.0/1.0' = 100%. CLAYSTONE: same as above with more sands; dry.</p> | |
| 105 | | | <p><u>38.5-39.5' SAMPLE.</u> Recovered 1.3/1.0' = 130%. CLAYSTONE: olive black (5 Y 2/1) to dark gray (N 3/0); some very fine-grained sand with moderate yellowish brown (10 YR 5/4) staining; some silt; some organics; dry.</p> | |
| | | | <p><u>39.5-40.5' SAMPLE.</u> Recovered 1.2/1.0' = 120%. CLAYSTONE: same as above with less sands and less iron staining; dry.</p> | |
| 110 | | | <p><u>40.5-41.5' SAMPLE.</u> Recovered 1.2/1.0' = 120%. CLAYSTONE: olive black (5 Y 2/1) to dark gray (N 3/0); very fine-grained calcareous sand in fractures with moderate yellowish brown (10 YR 5/4) staining; at 41.2' band of caliche (or calcareous sand) reacts strongly with HCl; some organics; dry.</p> | |
| 115 | | | <p><u>41.5-42.5' SAMPLE.</u> Recovered 1.5/1.0' = 150%. CLAYSTONE: same as above; dry.</p> | |
| | | | <p><u>42.5-43.5' SAMPLE.</u> Recovered 1.4/1.0' = 140%. CLAYSTONE: same as above; dry.</p> | |

LOG OF BOREHOLE

Location Rocky Flats Plant; Mound Area
Coordinates N 36934.99 E 22715.72
Total Depth 110.40'

Borehole/Well No. 22-87BR
Ground Surface Elevation 5930.70'
Water Level Encountered 12.2'
Static 5852.04' (12/01/87)

Drilling Company Boyles Bros
Date Drilled Sept 30 & Oct 7-8, 1987
Drilling Method Hollow Stem Auger; Rotary Core
Logged By K.D. Holliway; J.B. Beraman
Geologist

Driller R. Sharp
Helper T. Merritt
Drilling Fluid 0.0 - 45.1' None;
45.1' - 110.4' Water
Checked By _____
Site Manager

CEARP Manager

Comments Surface casing set to 43.59' by K.D. Holliway on October 2, 1987

| Depth Feet | Graphic Log | Sample Type | Lithologic Description | Samples Collected or Other Tests Performed |
|---------------|----------------|----------------|---|---|
| | | | <p><u>45.1-49.50' SAMPLE.</u> Recovered 3.7/4.5' = 82%. RQD = 2.6/3.7' = 70%. 45.1-45.6': CLAYSTONE: dark greenish gray (5 GY 4/1); dense; very broken; probably slough. 45.6-47.4': SANDSTONE: dark greenish gray (5 GY 4/1); fine-grained; well sorted; some moderate brown (5 YR 4/4) iron stains; trace organics; fracture (~80°) at 46.5-46.7' filled with iron stains; moist. 47.4-49.5': CLAYSTONE: dark greenish gray (5 GY 4/1); dense; no stains; homogenous; dry to moist.</p> | |
| | | | <p><u>49.5-52.5' SAMPLE.</u> Recovered 2.7/3.0' = 90%. RQD = 1.2/2.7' = 44%. CLAYSTONE: olive gray (5 Y 3/2); no silt; no sand; homogenous; trace organic fragments; consolidated; moist.</p> | |
| | | | <p><u>52.5-56.5' SAMPLE.</u> Recovered 3.9/4.0' = 98%. RQD = 3.9/3.9' = 100%. CLAYSTONE: same as above; moist.</p> | |
| | | | <p><u>56.5-60.5' SAMPLE.</u> Recovered 3.8/4.0' = 95%. RQD = 1.3/3.8' = 34%. CLAYSTONE: dark gray (N 3/0) to grayish black (N 2/0); dense; homogenous; some carbonaceous debris; moist to wet.</p> | |

LOG OF BOREHOLE

Location Rocky Flats Plant; Mound Area
Coordinates N 36934.99 E 22715.72
Total Depth 110.40'

Borehole Well No. 22-87BR
Ground Surface Elevation 5930.70'
Water Level Encountered 12.2'
Static 5852.04' (12/01/87)

Drilling Company Boyles Bros
Date Drilled Sept 30 & Oct 7-8, 1987
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Logged By K.D. Holliway; J.B. Bergman
Geologist

Driller R. Sharp
Helper T. Merritt
Drilling Fluid 0.0 - 45.1' None;
45.1' - 110.4' Water
Checked By _____
Site Manager

CEARP Manager

Comments Surface casing set to 43.59' by K.D. Holliway on October 2, 1987

| Depth Feet | Graphic Log | Sample Type | Lithologic Description | Samples Collected or Other Tests Performed |
|---------------|----------------|----------------|---|---|
| | | | <u>60.5-64.5' SAMPLE.</u> Recovered 3.6/4.0' = 90%. RQD = 3.6/3.6' = 100%. CLAYSTONE: dark gray (N 3/0); dense; consolidated; homogenous; some carbona- ceous debris; sandy from 60.9-61.4'; moist to wet. | |
| | | | <u>64.5-68.5' SAMPLE.</u> Recovered 3.3/4.0' = 83%. RQD = 2.1/3.3' = 64%. 64.5-66.6': CLAYSTONE: same as above. 66.6-67.8': MUDSTONE: brownish gray (5 YR 4/1); very fine-grained; "sulphur-like" smell when HCl is added; abundant car- bonaceous fragments; fragments strongly react with HCl; cement only slightly re- acts when powdered; very hard and dense; dry. | |
| | | | <u>68.5-72.5' SAMPLE.</u> Recovered 4.0/4.0' = 100%. RQD = 3.7/4.0' = 93%. CLAYSTONE: brownish black (5 YR 2/1); trace very fine-grained sand; abundant organic fragments; moist to wet. | |
| | | | <u>72.5-76.5' SAMPLE.</u> Recovered 3.7/4.0' = 93%. RQD = 3.7/3.7' = 100%. CLAYSTONE: same as above; no sand; fractures at 76.0' and 76.3' (~45°); moist to wet. | |

LOG OF BOREHOLE

Location Rocky Flats Plant; Mound Area
Coordinates N 36934.99 E 22715.72
Total Depth 110.40'

Borehole/Well No. 22-87BR
Ground Surface Elevation 5930.70'
Water Level Encountered 12.2'
Static 5852.04' (12/01/87)

Drilling Company Boyles Bros
Date Drilled Sept 30 & Oct 7-8, 1987
Drilling Method Hollow Stem Auger; Rotary Core
Logged By K.D. Holliway; J.B. Beroman
Geologist

Driller R. Sharp
Helper T. Merritt
Drilling Fluid 0.0 - 45.1' None;
45.1' - 110.4' Water
Checked By _____
Site Manager

CEARP Manager

Comments Surface casing set to 43.59' by K.D. Holliway on October 2, 1987

| Depth Feet | Graphic Log | Sample Type | Lithologic Description | Samples Collected or Other Tests Performed |
|---------------|----------------|----------------|--|---|
| | | | <u>76.5-80.5' SAMPLE.</u> Recovered 4.0/4.0' = 100%. RQD = 3.6/4.0' = 90%. CLAYSTONE: same as above. TOTAL DEPTH OF HOLE: 78.50'; AD- JUST DEPTH. <u>78.5-82.5' SAMPLE.</u> Recovered 3.7/4.0' = 93%. RQD = 3.7/3.7' = 100%. 78.5-81.5': CLAYSTONE: same as above. 81.5-82.5': SANDSTONE: medium gray (N 5/0); well sorted; fine to very fine- grained; rounded; some silt; some organ- ics; consolidated; homogenous; moist. <u>82.5-86.5' SAMPLE.</u> Recovered 4.0/4.0' = 100%. RQD = 3.0/4.0' = 75%. SANDSTONE: medium gray (N 5/0); fine to medium-grained; rounded; well sorted; consolidated; calcareous cementation from 86.3-86.5'-strongly reacts with HCl; some clay layers <1" thick present throughout; wet to moist. | |

LOG OF BOREHOLE

Location Rocky Flats Plant; Mound Area
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Total Depth 110.40'

Borehole Well No. 22-87BR
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Drilling Company Boyles Bros
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Geologist

Driller R. Sharp
Helper T. Merritt
Drilling Fluid 0.0 - 45.1' None;
45.1' - 110.4' Water
Checked By _____
Site Manager

CEARP Manager

Comments Surface casing set to 43.59' by K.D. Holliway on October 2, 1987

| Depth Feet | Graphic Log | Sample Type | Lithologic Description | Samples Collected or Other Tests Performed |
|---------------|----------------|----------------|---|---|
| | | | <u>86.5-90.5' SAMPLE.</u> Recovered 2.6/4.0' = 65%. RQD = 1.3/2.6' = 50%. 86.5-87.1': SANDSTONE: medium light gray (N 6/0); fine to medium-grained; rounded; well sorted; calcareous cement; very dense and consolidated; dry. 87.1-88.5': INTERBEDDED SANDSTONE AND CLAYSTONE: sandstone layers medium gray (N 5/0); 0.5" to 2" thick; claystone layers medium dark gray (N 4/0); consolidated; moist. 88.5-89.1': CLAYSTONE: medium dark gray (N 4/0) with some very thin (<0.5') sandstone layers; same sand as above; moist. | |
| | | | <u>90.5-95.0' SAMPLE.</u> Recovered 4.0/4.5' = 89%. RQD = 3.3/4.0' = 83%. INTERBEDDED SANDSTONE/ CLAYSTONE: medium light gray (N 6/0) sandstone and medium dark gray (N 4/0) claystone; sandstone layers .05 to 1' thick; claystone layers 0.2-0.5' thick; decrease sandstone content with depth; crossbedded sands; moist to wet. | |

LOG OF BOREHOLE

Location Rocky Flats Plant; Mound Area
Coordinates N 36934.99 E 22715.72
Total Depth 110.40'

Borehole/Well No. 22-87BR
Ground Surface Elevation 5930.70'
Water Level Encountered 12.2'
Static 5852.04' (12/01/87)

Drilling Company Boyles Bros
Date Drilled Sept 30 & Oct 7-8, 1987
Drilling Method Hollow Stem Auger; Rotary Core
Logged By K.D. Holliday; J.B. Bergman
Geologist

Driller R. Sharp
Helper T. Merritt
Drilling Fluid 0.0 - 45.1' None;
45.1' - 110.4' Water
Checked By _____
Site Manager

CEARP Manager

Comments Surface casing set to 43.59' by K.D. Holliday on October 2, 1987

| Depth Feet | Graphic Log | Sample Type | Lithologic Description | Samples Collected or Other Tests Performed |
|---------------|----------------|----------------|--|---|
| | | | <u>95.0-99.0' SAMPLE.</u> Recovered 4.0/4.0' = 100%. RQD = 2.8/4.0' = 70%. INTERBEDDED SANDSTONE/ CLAY- STONE: same as above with claystone layer from 97.3-98.7'; moist to wet. | |
| | | | <u>99.0-103.0' SAMPLE.</u> Recovered 2.0/4.0' = 50%. RQD = 1.3/2.0' = 65%. INTERBEDDED SANDSTONE/ CLAY- STONE: same as above with less sand content; layers are not distinct gradual changes; moist to wet. | |
| | | | <u>102.0-107.0' SAMPLE.</u> Recovered 5.0/5.0' = 100%. RQD = 5.0/5.0' = 100%. CLAYSTONE: medium dark gray (N 4/0); trace silt; trace carbonaceous fragments; homogenous; consolidated; dense; moist (picked up one foot of core from last run). | |
| | | | <u>107.0-111.0' SAMPLE.</u> Recovered 2.0/4.0' = 50%. RQD = 0.0/2.0' = 0%. CLAYSTONE: same as above; very bro- ken; moist. | |
| | | | TOTAL DEPTH: 110.40' | |

WELL COMPLETION INFORMATION

Location Rocky Flats Plant; Mound Area

Coordinates N 36934.99 E 22715.72

Total Depth: Well 88.70'

Borehole 110.40'

Formation of Completion Arapahoe Formation

Casing Material Sch 5, type 316 TFJ stainless steel

Screen Material 0.010" wire wrap, type 316 TFJ stainless steel

Date Installed Oct. 10, 1987

Installed By K. D. Holliway
Geologist

Well No. 22-87BR

Elevation: Ground Surface 5930.70'

Top of Casing 5932.49'

Casing Diameter 2" ID

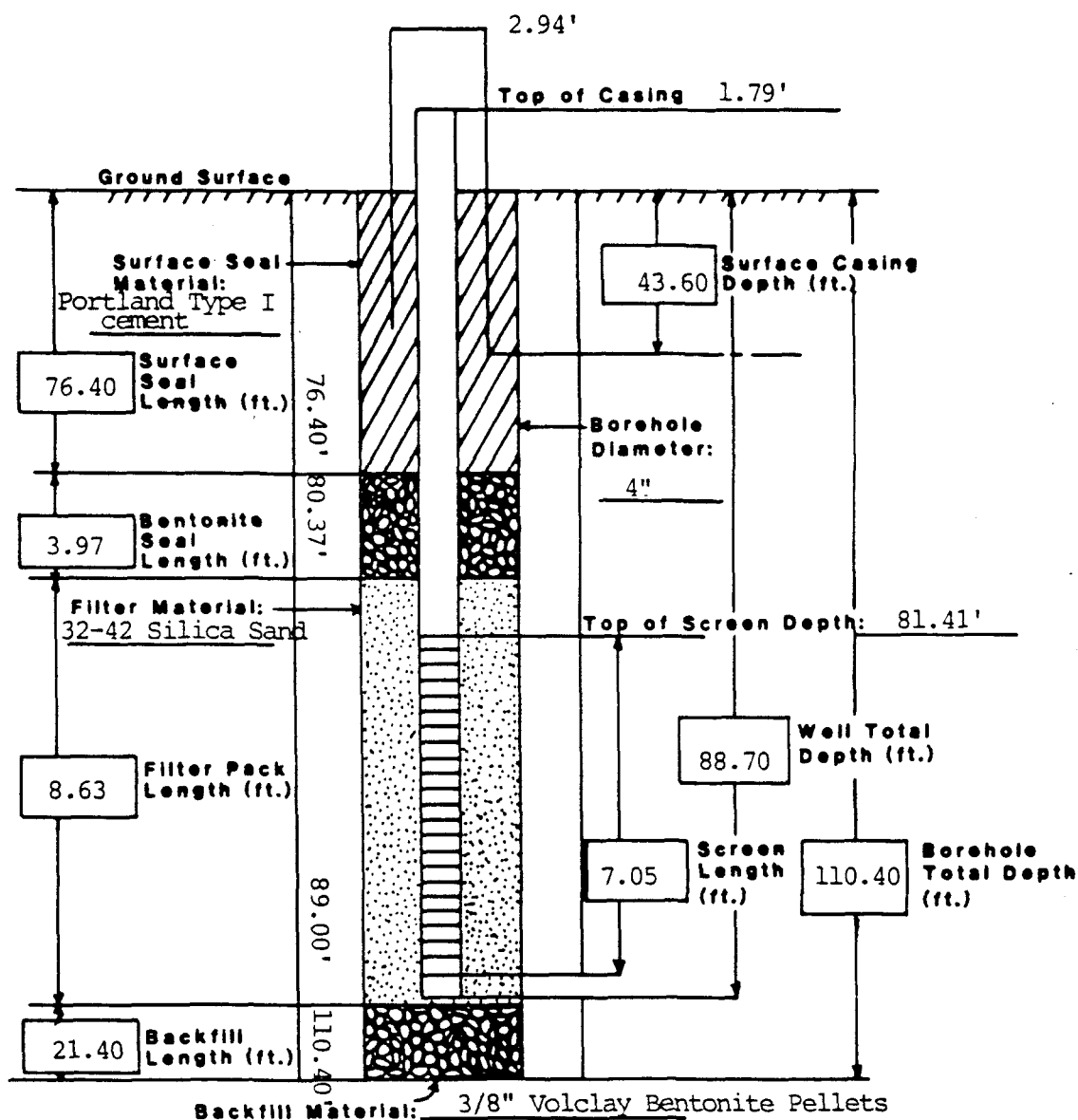
Surface Casing Diameter 5" ID

Approved By _____

Site Manager

CEARP Manager

Comments Surface casing set to 43.60' by K. D. Holliway October 9, 1987



Well No.: 22-87BR

WELL DEVELOPMENT SUMMARY SHEET

[illegible]

PACKER TEST DATA SHEET

Job No.: 2029-17-02
 Location: Rocky Flats Plant; Mound Area
 Well No.: 22-87BR
 Borehole Diameter: 0.333'
 Acrylic Tube Diameter: 0.1663'
 Static Water Level: 78.66'
 Date of Water Level: 12/1/87
 Page 1 of 2
 Comments: Test interval #5 failed on 2/3 pressure test and second 1/3 pressure test due to water gain in acrylic tube and test intervals #6 and 7 failed on second 1/3 pressure test.

| Test Interval No. | Top of Test Interval | Bottom of Test Interval | Test Length (minutes) | Gage Pressure | Gage Height | Avg. H ₂ O Height | Gage Height + Avg. H ₂ O Height | Δh | Date of Test | Lithology | Geologist |
|-------------------|----------------------|-------------------------|-----------------------|---------------|-------------|------------------------------|--|------------|--------------|-----------|-----------|
| 1 | 92.35 | 102.00 | 15 | 0 | 7.50 | 3.45 | 10.95 | 0.88 | 10/09/87 | Kass | JBB |
| | | | 15 | 18.5 | 7.50 | N/A | 7.50 | 1.66 | 10/09/87 | Kass | JBB |
| | | | 15 | 0 | 7.50 | 2.70 | 10.20 | 0.59 | 10/09/87 | Kass | JBB |
| 2 | 82.70 | 92.35 | 15 | 0 | 7.50 | 2.12 | 9.62 | 2.93 | 10/09/87 | Kass | JBB |
| | | | 15 | 16.5 | 7.50 | N/A | 7.50 | 3.88 | 10/09/87 | Kass | JBB |
| | | | 15 | 0 | 7.50 | 2.95 | 10.45 | 2.56 | 10/09/87 | Kass | JBB |
| 3 | 81.50 | 91.15 | 15 | 0 | 7.50 | 3.62 | 11.12 | 2.67 | 10/09/87 | Kass | JBB |
| | | | 15 | 16.05 | 7.50 | N/A | 7.50 | 4.43 | 10/09/87 | Kass | JBB |
| | | | 15 | 0 | 7.50 | 1.94 | 9.44 | 1.90 | 10/09/87 | Kass | JBB |
| 4 | 71.85 | 81.50 | 15 | 0 | 7.50 | 4.38 | 11.88 | 0.03 | 10/09/87 | KCL | JBB |
| | | | 15 | 13.5 | 7.50 | N/A | 7.50 | 0.15 | 10/09/87 | KCL | JBB |
| | | | 15 | 0 | 7.50 | 5.37 | 12.87 | 0.00 | 10/09/87 | KCL | JBB |
| 5 | 62.20 | 71.85 | 15 | 0 | 6.70 | 4.91 | 11.61 | 0.01 | 10/12/87 | KCL | KDH |
| | | | 15 | 11.8 | 6.70 | N/A | 6.70 | -0.03 | 10/12/87 | KCL | KDH |
| | | | 15 | 0 | 6.70 | 4.41 | 11.11 | -0.37 | 10/12/87 | KCL | KDH |
| 6 | 52.55 | 62.20 | 15 | 0 | 6.70 | 5.35 | 12.05 | 0.05 | 10/12/87 | KCL | KDH |
| | | | 15 | 9.5 | 6.70 | N/A | 6.70 | 0.12 | 10/12/87 | KCL | KDH |
| | | | 15 | 0 | 6.70 | 1.52 | 8.22 | -0.11 | 10/12/87 | KCL | KDH |

Static Water Level: 78-66'
Date of Water Level: 12/1/87
Page 2 of 2

Static Water Level: 78.66'

Date of Water Level: 12/1/87Page 2 of 2

| | | |
|--------------------|--------|-----------|
| Borehole Diameter: | 0.333' | Comments: |
|--------------------|--------|-----------|

Acrylic Tube Diameter: 0.1663"

[illegible]

PACKER TEST ANALYSIS

WELL NO. 22-87BR

ROCKY FLATS PLANT; MOUND AREA

JOB NO. 2029-17-02

DATE TESTED: 10/12/87

BY: K.D. HOLLIWAY

TEST INTERVAL (FEET BELOW G.S.): 45.60 - 52.55

MATERIAL TESTED: ARAPAHOE CLAYSTONE

DEPTH TO WATER (FEET BELOW G.S.): 78.66

$$K = \frac{Q}{2(PI)(L)(H)} \frac{L}{LN\left(\frac{R}{r}\right)}$$

1ST P1/3 TEST

Q = INJECTION RATE = .00008688 (FEET³/MIN)

L = LENGTH OF TEST INTERVAL = 6.95 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 49.07 + 11.15 + .00 * 2.31 = 60.22

R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .0000001233 FT/MIN

K = .00000006 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00021721 (FEET³/MIN)

L = LENGTH OF TEST INTERVAL = 6.95 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 49.07 + 6.70 + 8.00 * 2.31 = 74.25

R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .0000002500 FT/MIN

K = .00000013 CM/SEC

2ND P1/3 TEST

TEST ABORTED

PACKER TEST ANALYSIS

WELL NO. 22-87BR

ROCKY FLATS PLANT; MOUND AREA

JOB NO. 2029-17-02

DATE TESTED: 10/12/87

BY: K.D. HOLLIWAY

TEST INTERVAL (FEET BELOW G.S.): 52.55 - 62.20

MATERIAL TESTED: ARAPAHOE CLAYSTONE

DEPTH TO WATER (FEET BELOW G.S.): 78.66

$$K = \frac{Q}{2(\pi)(L)(H)} \ln\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00007240 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 9.65 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 57.38 + 12.05 + .00 * 2.31 = 69.43

R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .0000000698 FT/MIN

K = .00000004 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00017377 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 9.65 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 57.38 + 6.70 + 9.50 * 2.31 = 86.02

R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .0000001353 FT/MIN

K = .00000007 CM/SEC

2ND P1/3 TEST

TEST ABORTED

PACKER TEST ANALYSIS

WELL NO. 22-87BR

ROCKY FLATS PLANT; MOUND AREA

JOB NO. 2029-17-02

DATE TESTED: 10/12/87

BY: K.D. HOLLIWAY

TEST INTERVAL (FEET BELOW G.S.): 62.20 - 71.85

MATERIAL TESTED: ARAPAHOE CLAYSTONE

DEPTH TO WATER (FEET BELOW G.S.): 78.66

$$K = \frac{Q}{2(\pi)(L)(H)} \ln\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00001448 (FEET³/MIN)

L = LENGTH OF TEST INTERVAL = 9.65 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 67.03 + 11.61 + .00 * 2.31 = 78.64

R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .0000000123 FT/MIN

K = .00000001 CM/SEC

P2/3 TEST

TEST ABORTED

2ND P1/3 TEST

TEST ABORTED

PACKER TEST ANALYSIS
WELL NO. 22-87BR
ROCKY FLATS PLANT; MOUND AREA JOB NO. 2029-17-02
DATE TESTED: 10/09/87 BY: J.B. BERGMAN
TEST INTERVAL (FEET BELOW G.S.): 71.85 - 81.50
MATERIAL TESTED: ARAPAHOE CLAYSTONE
DEPTH TO WATER (FEET BELOW G.S.): 78.66

$$K = \frac{Q}{2(\pi)(L)(H)} \frac{L}{\ln(\frac{L}{R})}$$

1ST P1/3 TEST

Q = INJECTION RATE = .00004344 (FEET³/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 76.68 + 11.88 + .00 * 2.31 = 88.56
R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .0000000328 FT/MIN
K = .00000002 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00021721 (FEET³/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 76.68 + 7.50 + 13.50 * 2.31 = 115.36
R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .0000001261 FT/MIN
K = .00000006 CM/SEC

2ND P1/3 TEST

TEST ABORTED

PACKER TEST ANALYSIS
WELL NO. 22-87BR
ROCKY FLATS PLANT; MOUND AREA JOB NO. 2029-17-02
DATE TESTED: 10/09/87 BY: J.B. BERGMAN
TEST INTERVAL (FEET BELOW G.S.): 81.50 - 91.15
MATERIAL TESTED: ARAPAHOE SANDSTONE
DEPTH TO WATER (FEET BELOW G.S.): 78.66

$$K = \frac{Q}{2(\pi)(L)(H)} \ln\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00386629 (FEET³/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 78.66 + 11.12 + .00 * 2.31 = 89.78
R = BOREHOLE RADIUS = .17 FEET
K = HYDRAULIC CONDUCTIVITY = .00000288 FT/MIN
K = .00000146 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00641485 (FEET³/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 78.66 + 7.50 + 16.05 * 2.31 = 123.24
R = BOREHOLE RADIUS = .17 FEET
K = HYDRAULIC CONDUCTIVITY = .00000349 FT/MIN
K = .00000177 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00275129 (FEET³/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 78.66 + 9.44 + .00 * 2.31 = 88.10
R = BOREHOLE RADIUS = .17 FEET
K = HYDRAULIC CONDUCTIVITY = .00000209 FT/MIN
K = .00000106 CM/SEC

PACKER TEST ANALYSIS
WELL NO. 22-87BR
ROCKY FLATS PLANT; MOUND AREA JOB NO. 2029-17-02
DATE TESTED: 10/09/87 BY: J.B. BERGMAN
TEST INTERVAL (FEET BELOW G.S.): 82.70 - 92.35
MATERIAL TESTED: ARAPAHOE SANDSTONE
DEPTH TO WATER (FEET BELOW G.S.): 78.66

$$K = \frac{Q}{2(\pi)(L)(H)} \ln\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00424278 (FEET³/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 78.66 + 9.62 + .00 * 2.31 = 88.28
R = BOREHOLE RADIUS = .17 FEET
K = HYDRAULIC CONDUCTIVITY = .00000322 FT/MIN
K = .00000163 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00561843 (FEET³/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 78.66 + 7.50 + 16.50 * 2.31 = 124.28
R = BOREHOLE RADIUS = .17 FEET
K = HYDRAULIC CONDUCTIVITY = .00000303 FT/MIN
K = .00000154 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00370700 (FEET³/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 78.66 + 10.45 + .00 * 2.31 = 89.11
R = BOREHOLE RADIUS = .17 FEET
K = HYDRAULIC CONDUCTIVITY = .00000279 FT/MIN
K = .00000141 CM/SEC

PACKER TEST ANALYSIS
WELL NO. 22-87BR
ROCKY FLATS PLANT; MOUND AREA JOB NO. 2029-17-02
DATE TESTED: 10/09/87 BY: J.B. BERGMAN
TEST INTERVAL (FEET BELOW G.S.): 92.35 - 102.00
MATERIAL TESTED: ARAPAHOE SANDSTONE
DEPTH TO WATER (FEET BELOW G.S.): 78.66

$$K = \frac{Q}{2(P_1)(L)(H)} \ln\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00127428 (FEET³/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 78.66 + 10.95 + .00 * 2.31 = 89.61
R = BOREHOLE RADIUS = .17 FEET
K = HYDRAULIC CONDUCTIVITY = .00000095 FT/MIN
K = .00000048 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00240376 (FEET³/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 78.66 + 7.50 + 18.50 * 2.31 = 128.90
R = BOREHOLE RADIUS = .17 FEET
K = HYDRAULIC CONDUCTIVITY = .00000125 FT/MIN
K = .00000063 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00085435 (FEET³/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 78.66 + 10.20 + .00 * 2.31 = 88.86
R = BOREHOLE RADIUS = .17 FEET
K = HYDRAULIC CONDUCTIVITY = .00000064 FT/MIN
K = .00000033 CM/SEC

ROCKY FLATS SOLAR PONDS

WATER LEVEL SUMMARY

| <u>WELL NUMBER</u> | <u>DATE</u> | <u>GROUND SURFACE ELEVATION</u> | <u>TOP OF CASING ELEVATION</u> | <u>STICK UP</u> | <u>DEPTH OF SI BASE</u> | <u>WATER DEPTH BELOW TOC</u> | <u>WATER SURFACE ELEVATION</u> |
|------------------------|-------------|---|--|---------------------|---------------------------------|--------------------------------------|--|
| 2287 | 11/12/87 | 5930.70 | 5932.49 | 1.79 | 88.46 | 50.70 | 5881.79 |
| | 12/01/87 | | | | | 80.45 | 5852.04 |
| | 12/22/87 | | | | | 50.50 | 5881.99 |
| | 01/27/88 | | | | | 80.50 | 5851.99 |
| | 02/29/88 | | | | | 80.70 | 5851.79 |
| | 03/21/88 | | | | | 80.60 | 5851.89 |
| | 04/18/88 | | | | | 80.50 | 5851.99 |

INDEX OF DATA

Boring No.: 37-87

Completed as well? Yes

Data in File

- ☒ Log of Borehole
- ☒ Well Construction Summaries
- ☒ Well Development Summaries
- ☐ Hydraulic Conductivity Test Data and Results
- ☐ Packer Test Data and Results
- ☒ Water Level Data
- ☒ Saturated Thickness Hydrographs

LOG OF BOREHOLE

Location Rocky Flats Plant; Solar Pond Area
Coordinates N 37507.14 E 22119.81
Total Depth 13.0'

Borehole/Well No. 37-87

Ground Surface Elevation 5967.03'

Water Level Encountered None

Static

Drilling Company Boyles Bros.

Driller T. High

Date Drilled October 26, 1987

Helper B. Keeney

Drilling Method Hollow Stem Auger

Drilling Fluid None

Logged By R. Treat
Geologist

Checked By _____
Site Manager

CEARP Manager

Comments _____

| Depth Feet | Graphic Log | Sample Type | Lithologic Description | Samples Collected or Other Tests Performed |
|---------------|----------------|----------------|---|--|
| 0 | | | <u>ARTIFICIAL FILL/DISTURBED</u> | |
| | | | <u>0.0-2.0' SAMPLE</u> Recovered 1.11/2.0' = 70%. GRAVEL AND SAND: moderate brown (5 YR 3/4) to grayish brown (5 YR 3/2); medium and coarse sand with small gravel (0.55 mm to 2.25 mm); subangular; angular and few subrounded; weakly cemented; light; moist. | HNu background=0.6. OVA background = 2.6. Ludlum background = 0.0. |
| 5 | | | <u>2.0-4.0' SAMPLE</u> Recovered 1.7/2.0' = 85%. 2.0-2.7': GRAVEL AND SAND: same as above. | <u>2.0-3.7'</u> : Readings in augers: HNu = 0.2; OVA = 3.2. |
| 10 | | | <u>ROCKY FLATS ALLUVIUM</u> | |
| | | | 2.7-3.7': CLAYEY GRAVEL: reddish brown; weakly to moderately cemented; poorly sorted; angular and subangular gravels; few rounded; slightly calcareous; light moist. | |
| 15 | | | <u>4.0-7.0' SAMPLE</u> Recovered 0.8/3.0' = 27%. CLAYEY GRAVEL: same as above. | |
| | | | <u>7.0-9.5' SAMPLE</u> Recovered 2.5/2.5' = 100%. 7.0-8.5': SAND AND GRAVEL: light brown (5 YR 5/6) to a moderate brown (5 YR 4/4) sand; well-sorted and range (2.0-1.5 mm) to 0.5-0.0 Ø with gravel 0.25 mm to 1.5 mm and scattered large size; medium dense; weakly cemented; moist. | |
| 20 | | | | |

LOG OF BOREHOLE

Location Rocky Flats Plant; Solar Pond Area
Coordinates N 37507.14 E 22119.81
Total Depth 13.0'

Borehole/Well No. 37-87 (cont'd.)
Ground Surface Elevation 5967.03'
Water Level Encountered None

Drilling Company Boyles Bros.
Date Drilled October 26, 1987
Drilling Method Hollow Stem Auger
Logged By R. Treat
Geologist

Static _____
Driller T. High
Helper B. Keeney
Drilling Fluid None
Checked By _____
Site Manager
CEARP Manager

Comments _____

| Depth Feet | Graphic Log | Sample Type | Lithologic Description | Samples Collected or Other Tests Performed |
|---------------|----------------|----------------|---|---|
| 0 | | | <u>ARAPAHOE FORMATION</u> | |
| | | | 8.5-9.5' CLAYSTONE: light gray (N 7/0) medium plastic, very calcareous in upper 12" to slightly calcareous; streaked and highly effervescess with HCl; massive; blocky; weathered; moist. | |
| <u>5</u> | | | <u>9.5-13.0' SAMPLE</u> Recovered 3.5/3.5' = 100%. CLAYSTONE: light gray (N 7/0) to vary- ing brownish gray; slightly oxide stained; blocky; massive; highly to moderately plastic; weathered; moist. | |
| | | | TOTAL DEPTH: 13.0' | |
| <u>10</u> | | | | |
| | | | | |
| <u>15</u> | | | | |
| | | | | |
| <u>20</u> | | | | |

WELL COMPLETION INFORMATION

Location: Rocky Flats Plant; Solar Ponds Area

Well No. 37-87

Coordinates N 37507.14 E 22119.81

Elevation: Ground Surface 5967.03'

Total Depth: Well 9.0'

Top of Casing 5969.02'

Borehole 13.0'

Formation of Completion Rocky Flats Alluvium

Casing Material Sch 5, Type 316, TFJ Stainless Steel

Casing Diameter 2" ID

Screen Material 0.010" wire wrap, Type 316, TFJ Stainless Steel

Surface Casing Diameter 5" ID

Date Installed October 27, 1987

Approved By _____

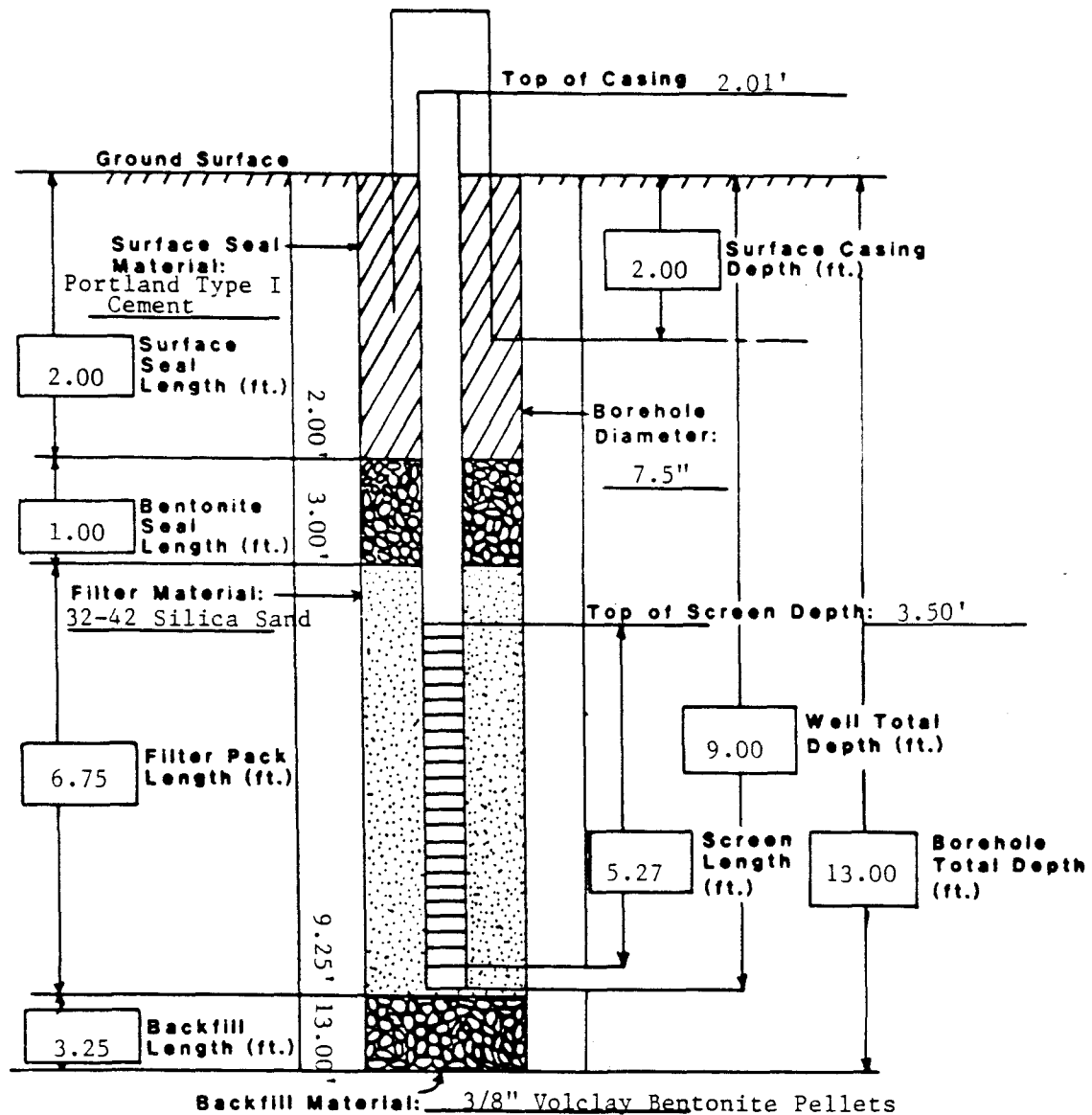
Installed By R. Treat

Site Manager

Geologist

CEARP Manager

Comments _____



Well No.: 37-87

WELL DEVELOPMENT SUMMARY SHEET

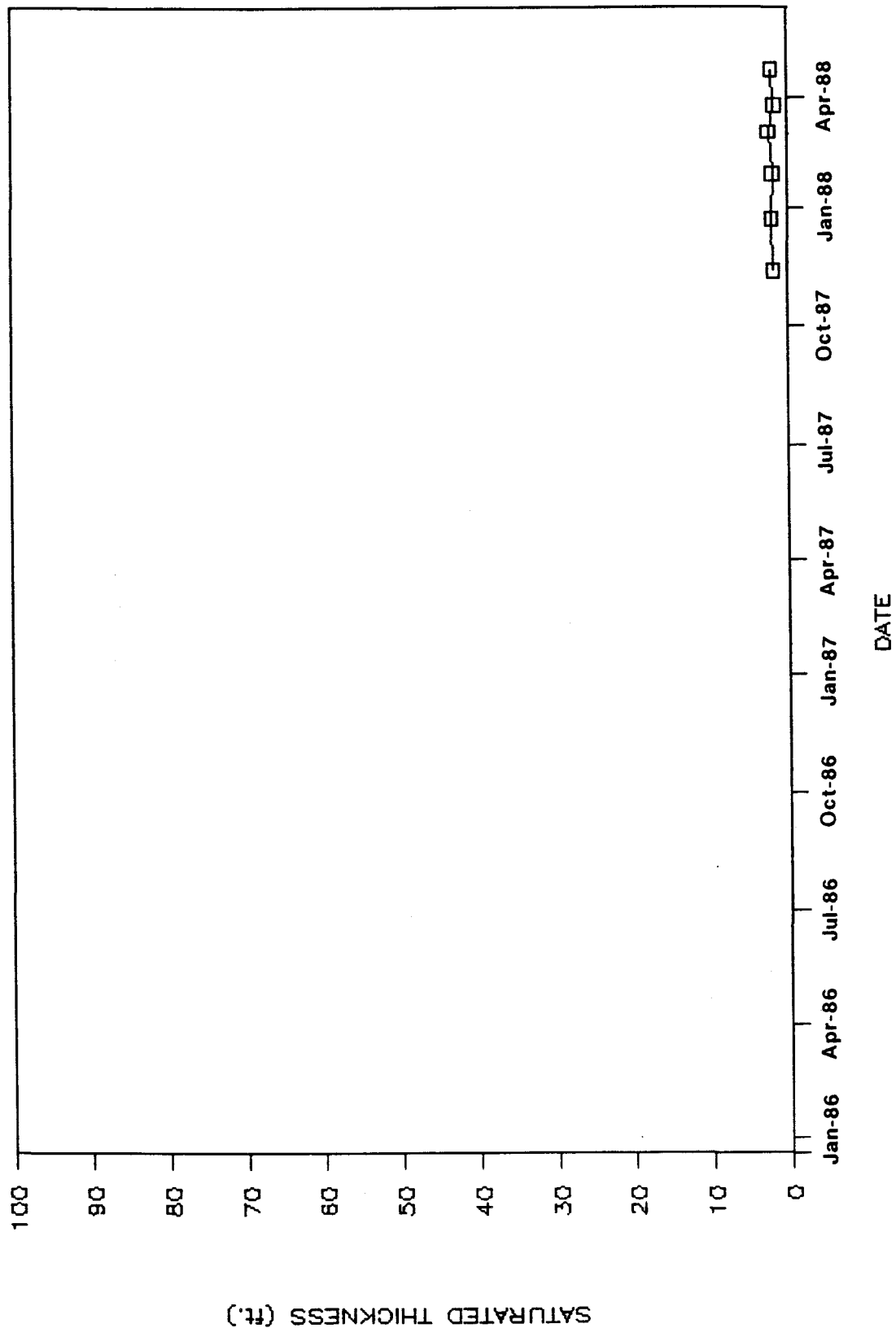
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ROCKY FLATS SOLAR PONDS

WATER LEVEL SUMMARY

| <u>WELL</u> <u>NUMBER</u> | <u>DATE</u> | <u>GROUND</u> <u>SURFACE</u> <u>ELEVATION</u> | <u>TOP OF</u> <u>CASING</u> <u>ELEVATION</u> | <u>STICK</u> <u>UP</u> | <u>DEPTH</u> <u>OF SI</u> <u>BASE</u> | <u>WATER</u> <u>DEPTH</u> <u>BELOW TOC</u> | <u>WATER</u> <u>SURFACE</u> <u>ELEVATION</u> |
|------------------------------|-------------|---|--|---------------------------|---|--|--|
| 3787 | 11/12/87 | 5967.03 | 5969.02 | 1.99 | 8.77 | 6.90 | 5962.12 |
| | 12/22/87 | | | | | 6.60 | 5962.42 |
| | 01/27/88 | | | | | 6.80 | 5962.22 |
| | 02/29/88 | | | | | 6.30 | 5962.72 |
| | 03/21/88 | | | | | 7.00 | 5962.02 |
| | 04/18/88 | | | | | 6.60 | 5962.42 |

SATURATED THICKNESS IN WELL # 37-87(SP)



INDEX OF DATA

Boring No.: 38-87

Completed as well? Yes

Data in File

- ☒ Log of Borehole
- ☒ Well Construction Summaries
- ☒ Well Development Summaries
- ☐ Hydraulic Conductivity Test Data and Results
- ☐ Packer Test Data and Results
- ☒ Water Level Data
- ☒ Saturated Thickness Hydrographs

LOG OF BOREHOLE

Location Rocky Flats Plant; Solar Pond Area
Coordinates N 37370.70 E 22020.53
Total Depth 14.0'

Borehole/Well No. 38-87
Ground Surface Elevation 5971.79'
Water Level Encountered None
Static _____

Drilling Company Boyles Bros.
Date Drilled October 27, 1987
Drilling Method Hollow Stem Auger
Logged By R. Treat
Geologist

Driller T. High
Helper B. Keeney
Drilling Fluid None
Checked By _____
Site Manager
CEARP Manager

Comments _____

| Depth Feet | Graphic Log | Sample Type | Lithologic Description | Samples Collected or Other Tests Performed |
|---------------|----------------|----------------|--|---|
| 0 | | | ARTIFICIAL FILL/DISTURBED | |
| | | | <u>0.0-2.0' SAMPLE.</u> Recovered 0.8/2.0 = 45%. GRAVEL AND SAND: very pale orange (10 YR 8/2) to dark brown with gravel subangular, angular (0.5 mm to 3.25 mm) with possible scattered cobbles, fine-grained sand; weakly cemented; light moist. | HNu background=0.4. OVA background = 0.6. Ludlum background = 0.0. No readings above background. |
| 5 | | | <u>2.0-4.0' SAMPLE.</u> Recovered 0.8/2.0' = 45%. GRAVEL: slightly sandy to very sandy; sand range (3.0-2.5 Ø) to (2.5-1.0 Ø) with gravel (0.75 mm to 3.25 mm); angular; calcareous; weakly cemented; subangular; well to poorly sorted; light moist. | |
| 10 | | | ROCKY FLATS ALLUVIUM | |
| | | | <u>4.0-7.0' SAMPLE.</u> Recovered 1.2/3.0 = 40%. SAND AND GRAVEL: light brown (5 YR 5/6) to pale brown (5 YR 5/2) with sand (3.0-2.5 Ø) and scattered sands (1.5-1.0 mm); gravel (0.25 mm to 2.00 mm); weakly cemented; poorly sorted; angular-subangular gravel; light moist. | |
| 15 | | | | |
| 20 | | | | |

LOG OF BOREHOLE

Location Rocky Flats Plant; Solar Pond Area
 Coordinates N 37370.70 E 22020.53
 Total Depth 14.0'

Borehole/Well No. 38-87 (cont'd.)
 Ground Surface Elevation 5971.79'
 Water Level Encountered None

Drilling Company Bovles Bros.
 Date Drilled October 27, 1987
 Drilling Method Hollow Stem Auger
 Logged By R. Treat
 Geologist

Static _____
 Driller T. High
 Helper B. Keeney
 Drilling Fluid None
 Checked By _____
 Site Manager
 CEARP Manager

Comments _____

| Depth Feet | Graphic Log | Sample Type | Lithologic Description | Samples Collected or Other Tests Performed |
|---------------|----------------|----------------|---|---|
| | | | <u>7.0-10.0' SAMPLE.</u> Recovered 3.0/3.0' = 100%. 7.0-7.5': CLAYEY SAND: light brown (5 YR 6/4) Fine-grained sand (3.0-2.5 Ø); gravel to 1.75 mm; subangular and subrounded; some scattered gravel; moderately calcareous; weakly cemented; moist. | |
| | | | <u>ARAPAHOE FORMATION</u> 7.5-9.0': CLAYSTONE: very pale orange (10 YR 8/2) to medium light gray (N 6/0); very calcareous; massive; medium plastic; blocky; weathered; moist. | |
| | | | 9.0-10.0': CLAYSTONE: medium light gray (N 6/0); massive; highly plastic; blocky; only slightly calcareous; streaked; weathered; moist. | |
| | | | <u>10.0-14.0' SAMPLE.</u> Recovered 5.2/4.0 = 130%. CLAYSTONE: medium light gray (N 6/0) down to approximately 11.2'; transition to light gray and severely oxide (Fe) stained brown; medium plastic; massive; only slightly calcareous streaked; blocky; weathered; moist. | |
| | | | TOTAL DEPTH: 14.0'. | |

WELL COMPLETION INFORMATION

Location Rocky Flats Plant; Solar Ponds Area

Well No. 38-87

Coordinates N 37370.70 E 22020.53

Elevation: Ground Surface 5971.79'

Total Depth: Well 9.50'

Top of Casing 5973.95'

Borehole 14.00'

Formation of Completion Rocky Flats Alluvium

Casing Material Sch 5, Type 316, TFJ Stainless Steel

Casing Diameter 2" ID

Screen Material 0.010" wire wrap, Type 316, TFJ Stainless Steel

Surface Casing Diameter 5" ID

Date Installed October 28, 1987

Approved By _____

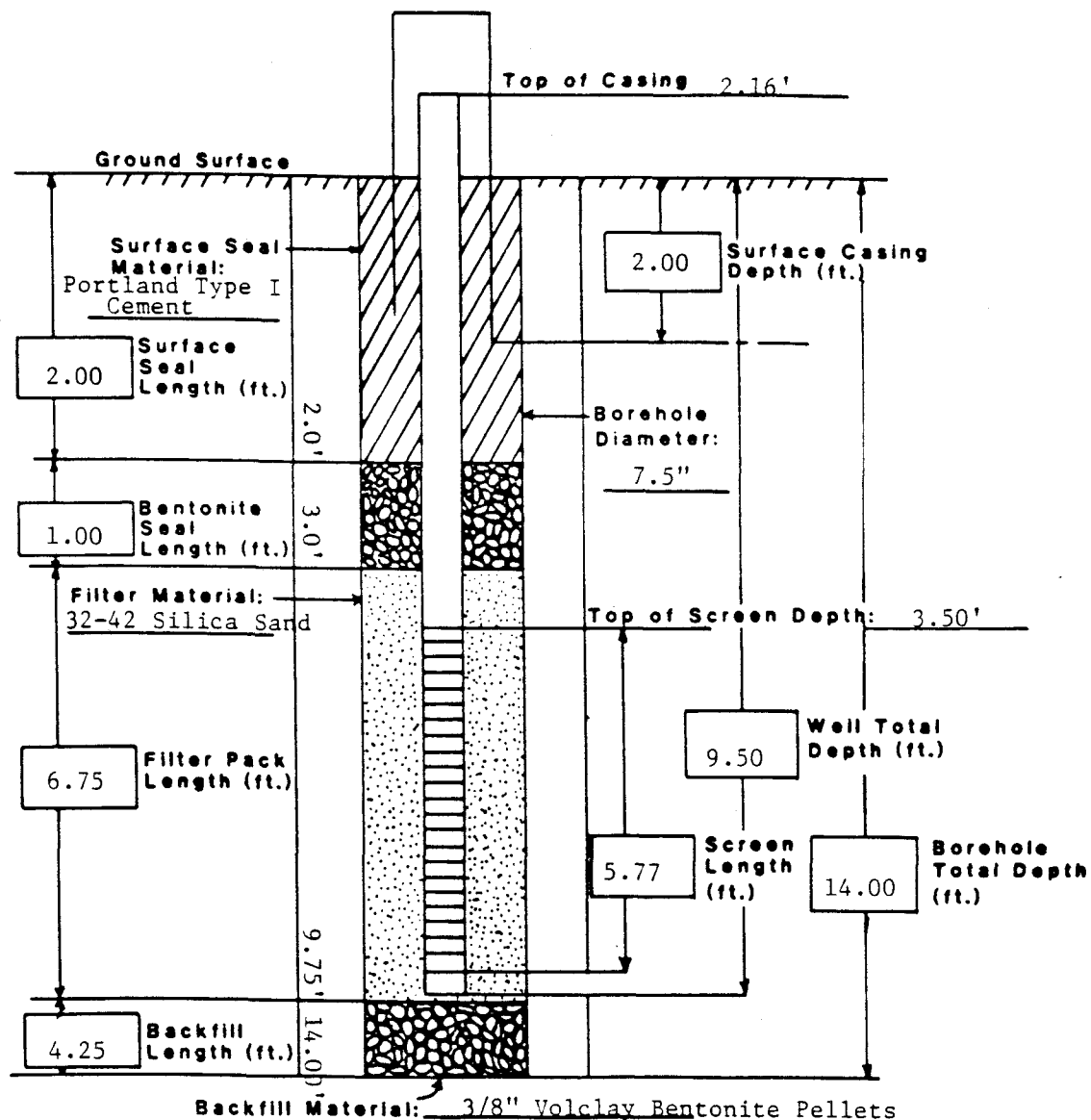
Installed By R. Treat

Site Manager

Geologist

CEARP Manager

Comments _____



Well No.: 38-87

WELL DEVELOPMENT SUMMARY SHEET

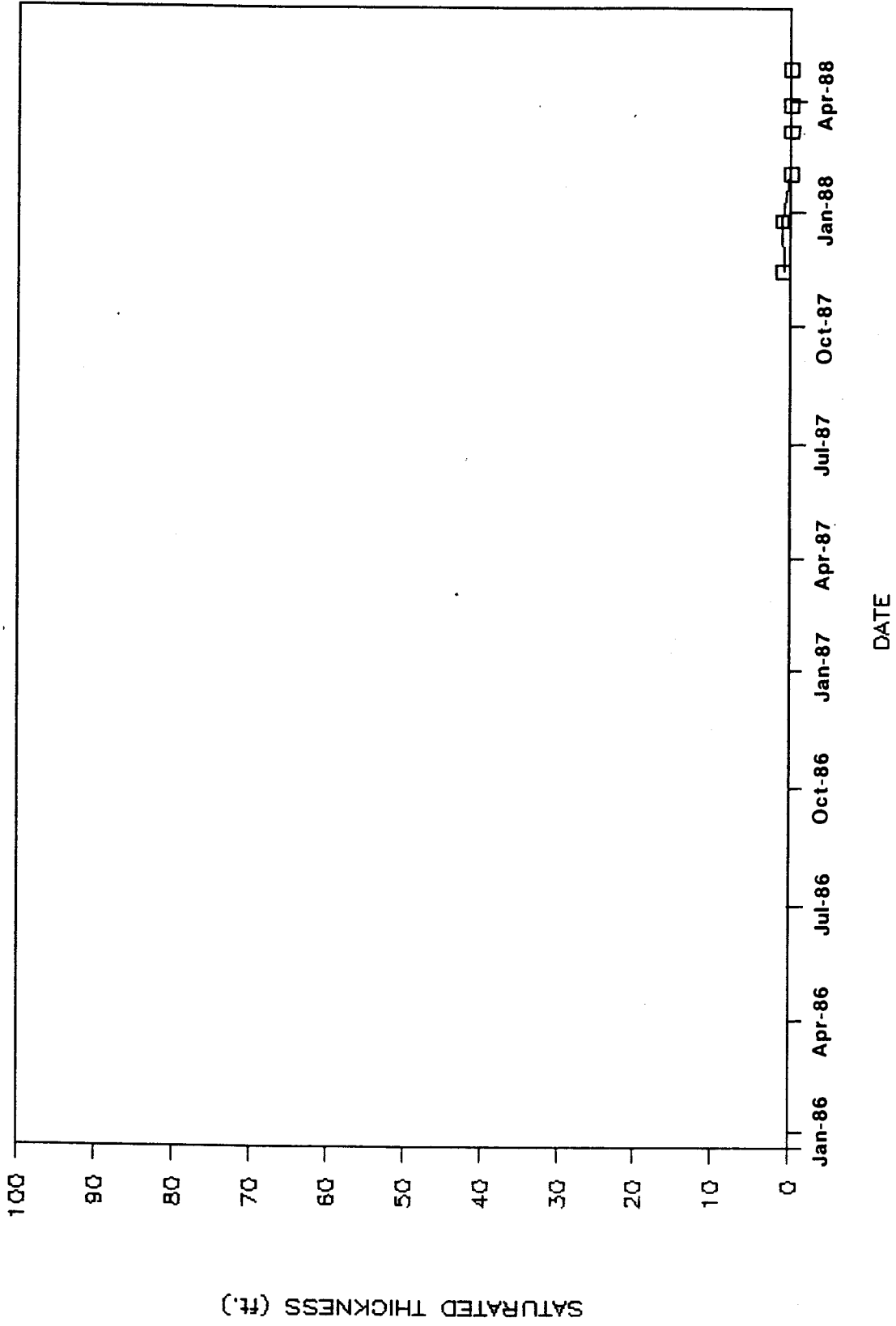
[illegible]

ROCKY FLATS SOLAR PONDS

WATER LEVEL SUMMARY

| <u>WELL</u> <u>NUMBER</u> | <u>DATE</u> | <u>GROUND</u> <u>SURFACE</u> <u>ELEVATION</u> | <u>TOP OF</u> <u>CASING</u> <u>ELEVATION</u> | <u>STICK</u> <u>UP</u> | <u>DEPTH</u> <u>OF SI</u> <u>BASE</u> | <u>WATER</u> <u>DEPTH</u> <u>BELOW TOC</u> | <u>WATER</u> <u>SURFACE</u> <u>ELEVATION</u> |
|------------------------------|-------------|---|--|---------------------------|---|--|--|
| 3887 | 11/12/87 | 5971.79 | 5973.95 | 2.16 | 9.27 | 8.30 | 5965.65 |
| | 12/21/87 | | | | | 8.20 | 5965.75 |
| | 01/27/88 | | | | | -1.00 | DRY |
| | 02/29/88 | | | | | -1.00 | DRY |
| | 03/21/88 | | | | | -1.00 | DRY |
| | 04/18/88 | | | | | -1.00 | DRY |

SATURATED THICKNESS IN WELL # 38-87 (SP)



INDEX OF DATA

Boring No.: 39-87BF./SP08-87

Completed as well? Yes

Data in File

- ☒ Log of Borehole
- ☒ Well Construction Summaries
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- ☒ Packer Test Data and Results
- ☒ Water Level Data
- ☒ Saturated Thickness Hydrographs

LOG OF BOREHOLE

Location Rocky Flats Plant; Solar Pond Area
Coordinates N 38094.04 E 22166.32
Total Depth 140.00'

Borehole/Well No. 39-87BR/SP08-87
Ground Surface Elevation 5947.10'
Water Level Encountered _____

Drilling Company Boyles Bros.
Date Drilled Oct. 29-30 and Nov. 6-10, 1987
Drilling Method Hollow Stem Auger; NC Core
Logged By R. Treat; K.D. Holliway
Geologist

Static _____
Driller T. High
Helper B. Keeney
Drilling Fluid None
Checked By _____
Site Manager
CEARP Manager

Comments _____

| Depth Feet | Graphic Log | Sample Type | Lithologic Description | Samples Collected or Other Tests Performed |
|---------------|----------------|----------------|--|--|
| 0 | | | ARTIFICIAL FILL/DISTURBED | |
| | | | <u>0.0-2.0' SAMPLE.</u> Recovered 0.7/2.0' = 35%. GRAVEL AND CLAY: dark dusky brown (5 YR 2/2) to mixed light brown; weakly cemented; subangular, subrounded quartzite gravel; poorly sorted; low plastic; slightly sandy; fine-grained; light moist. | HNu background=0.2. OVA Background=2.8 Ludlum background = 0.0 |
| 5 | | | <u>2.0-3.5' SAMPLE.</u> Recovered 1.5/1.5' = 100%. 2.0-3.2': GRAVEL AND CLAY: dark yellowish orange (10 YR 6/6) to moderate yellowish orange (10 YR 5/4) with gravel to 4.00 mm and larger; sand varying (2.0-1.5 Ø to 0.5-1.0 Ø); light moist. 3.2-3.5': CLAY: dark yellowish orange (10 YR 6/6) moderately cemented; slightly sandy; fine-grained; occasional small scattered gravel; highly plastic; very moist. | <u>0.0-2.0':</u> Field screen readings: HNu = 0.2 (0.2); OVA = 2.8 (2.8). No ludlum readings above background. <u>2.0-3.5':</u> Field screen readings: HNu = 0.2 (0.2); OVA = 2.8 (2.8). No ludlum readings above background. |
| 10 | | | <u>3.5-6.5' SAMPLE.</u> Recovered 3.0/3.0' = 100%. 3.5-5.2': CLAY: moderate brown (5 YR 4/4) to varying gray; considerably oxide stained; low plastic; fine-grained sand (3.0-2.5 Ø); weakly cemented; claystone fragments; moist. | <u>3.5-6.5':</u> Upper contact sample: SP088703UC. <u>6.5-8.5':</u> Contact sample: SP088706CT. |
| 15 | | | ARAPAHOE FORMATION | <u>9.0-11.5':</u> Bedrock sample: SP088709BR. |
| | | | 5.2-6.5': CLAYEY SANDSTONE: light gray (N 7/0); fine-grained sand (3.0-2.5 Ø) and finer; weakly cemented; weathered; moist. | <u>11.5-14.0':</u> Field screen readings: HNu = 0.2 (0.2); OVA = 2.8 (2.8). <u>14.0-16.5':</u> Field screen readings: HNu = 0.2 (0.2); OVA = 2.8 (2.8). |
| 20 | | | | |

LOG OF BOREHOLE

Location _____
Coordinates _____
Total Depth _____

Drilling Company _____
Date Drilled _____
Drilling Method _____
Logged By _____
Geologist

Borehole/Well No. 39-87BR/SP08-87 (con't.)

Ground Surface Elevation _____

Water Level Encountered _____

Static _____

Driller _____

Helper _____

Drilling Fluid _____

Checked By _____

Site Manager

CEARP Manager

Comments _____

| Depth Feet | Graphic Log | Sample Type | Lithologic Description | Samples Collected or Other Tests Performed |
|---------------|----------------|----------------|--|---|
| 20 | | | <u>6.5-9.0' SAMPLE.</u> Recovered 2.0/2.5' = 80%. SANDSTONE: light gray (N 7/0) to severely oxide stained brown; fine-grained sand (3.0-2.5 Ø); weakly cemented; massive; slight clay binder; weathered; moist. | <u>19.0'</u> : Readings in augers: HNu = 0; OVA = 28. |
| 25 | | | <u>9.0-11.5' SAMPLE.</u> Recovered 2.5/2.5' = 100%. CLAYEY SANDSTONE: varying oxide (Fe) browns to grays; fine-grained sand as above; massive; weakly cemented; weathered; moist. | |
| 30 | | | <u>11.5-14.0' SAMPLE.</u> Recovered 1.5/2.5' = 60%. CLAYEY SANDSTONE: as stated above continued moderately oxide stained; weathered. | |
| 35 | | | <u>14.0-16.5' SAMPLE.</u> Recovered 2.0/2.5' = 80%. CLAYEY SANDSTONE: light gray (N 7/0) to severely oxide stained brown; sand (3.0-2.5 Ø); massive; low plastic; weakly to moderately cemented; weathered; moist. | |
| 40 | | | <u>16.5-19.0' SAMPLE.</u> Recovered 2.3/2.5' = 92%. CLAYEY TO VERY CLAYEY SANDSTONE: oxide stained brown to light gray; low plastic; massive; weakly cemented; weathered; moist. | |

LOG OF BOREHOLE

Location _____
Coordinates _____
Total Depth _____

Borehole/Well No. 39-87BR/SP08-87 (con't.)

Ground Surface Elevation _____

Water Level Encountered _____

Static _____

Drilling Company _____

Driller _____

Date Drilled _____

Helper _____

Drilling Method _____

Drilling Fluid _____

Logged By _____

Checked By _____

Geologist

Site Manager

CEARP Manager

Comments _____

| Depth Feet | Graphic Log | Sample Type | Lithologic Description | Samples Collected or Other Tests Performed |
|---------------|----------------|----------------|---|---|
| 40 | | | <p><u>19.0-21.5' SAMPLE.</u> Recovered 1.4/2.5' = 56%. CLAYEY SANDSTONE: moderately oxide stained to light gray (N 7/0) massive, fine-grained; weathered; moist.</p> <p><u>21.5-24.0' SAMPLE.</u> Recovered 1.8/2.5 = 72%. CLAYEY SANDSTONE: light gray (N 7/0) to severely oxide stained brown; low plastic sands (3.5-3.0 Ø to 2.5-2.0 Ø); weakly cemented; massive; moist.</p> <p><u>24.0-26.5' SAMPLE.</u> Recovered 1.2/2.5 = 60%. 24.0-25.0': CLAYEY SANDSTONE: as noted above; moist. 25.0-25.2': CLAYSTONE: medium gray (N 4/0); massive; blocky; remaining slightly sandy (3.5-3.0 Ø); low plastic; weathered; moist.</p> <p><u>26.5-29.0' SAMPLE.</u> Recovered 2.5/2.5 = 100%. CLAYSTONE: medium gray (N 7/0) massive; medium plastic; slightly blocky; now only slightly oxide stained in streaks at 28.5 and 28.8' for 2" streaks.</p> <p><u>29.0-31.5' SAMPLE.</u> Recovered 1.3/2.5 = 52%. SANDY CLAYSTONE: as noted above but now moderately oxide (Fe) stained; massive; medium plastic; weathered; moist.</p> | <p><u>50.10-59.75':</u> Packer Test Interval #10.</p> <p><u>59.75-69.40':</u> Packer Test Interval # 9.</p> |
| 45 | | | | |
| 50 | | | | |
| 55 | | | | |
| 60 | | | | |

LOG OF BOREHOLE

Location _____
Coordinates _____
Total Depth _____

Borehole/Well No. 39-87BR/SP08-87 (con't.)

Ground Surface Elevation _____

Water Level Encountered _____

Static _____

Drilling Company _____

Driller _____

Date Drilled _____

Helper _____

Drilling Method _____

Drilling Fluid _____

Logged By _____

Checked By _____

Geologist

Site Manager

CEARP Manager

Comments _____

| Depth Feet | Graphic Log | Sample Type | Lithologic Description | Samples Collected or Other Tests Performed |
|---------------|----------------|----------------|--|--|
| 60 | | | <p><u>31.5-34.0' SAMPLE.</u> Recovered 2.2/2.5' = 88%. SANDY CLAYSTONE: upper formation (31.5-32.0') then slightly sandy, fine-grained; severely oxide stained brown to a light medium gray (N 6/0); massive; low to medium plastic; weathered; blocky; moist.</p> | |
| 65 | | | <p><u>34.0-36.5' SAMPLE.</u> Recovered 2.5/2.5 = 100%. CLAYSTONE: dark gray (N 3/0) to medium gray (N 5/0); massive; medium plastic; blocky; slightly sandy; fine-grained; moist.</p> | |
| 70 | | | <p><u>36.5-39.0' SAMPLE.</u> Recovered 1.7/2.5 = 68%. CLAYSTONE: moderate brown (5 YR 4/4) to medium dark gray (N 6/0); massive; blocky; medium plastic; slightly sandy; weathered; streaked, moist.</p> | |
| 75 | | | <p><u>39.0-41.5' SAMPLE.</u> Recovered 2.2/2.5 = 88%. CLAYSTONE/SHALE: medium dark gray (N 4/0); massive; blocky slightly sandy; fine-grained; medium plastic; moist.</p> | |
| 80 | | | <p><u>41.5-44.0' SAMPLE.</u> Recovered 1.2/2.5 = 48%. CLAYSTONE/SHALE: medium dark gray (N 4/0); massive; medium plastic somewhat blocky; just slightly sandy; light moist.</p> | <p><u>69.40-79.05'</u> Packer Test Interval # 8.</p> |

LOG OF BOREHOLE

Location _____
Coordinates _____
Total Depth _____

Drilling Company _____
Date Drilled _____
Drilling Method _____
Logged By _____
Geologist

Borehole/Well No. 39-87BR/SP08-87 (con't.)

Ground Surface Elevation _____

Water Level Encountered _____

Static _____

Driller _____

Helper _____

Drilling Fluid _____

Checked By _____

Site Manager

CEARP Manager

Comments _____

| Depth Feet | Graphic Log | Sample Type | Lithologic Description | Samples Collected or Other Tests Performed |
|---------------|----------------|----------------|--|--|
| 80 | | | <p><u>41.3-45.4' SAMPLE.</u> Recovered 1.68/4.10' = 41%. RQD = 1.04/1.68' = 62%.</p> <p>41.3-41.8': CLAYSTONE PLUG. 41.8-42.35': SILTY CLAYSTONE: dark gray (N 3/0) to olive black (5 Y 2/1); some very fine-grained sand; well sorted; unconsolidated; blocky; soft to medium hardness; damp.</p> <p>42.35-44.03': SANDY SILTY CLAYSTONE: olive black (5 Y 2/1); sand very fine-grained (3.5-4.0 Ø), well sorted; consolidated; blocky; medium hardness; some organics; damp.</p> | <p><u>79.05-88.70'</u>: Packer Test Interval # 7.</p> <p><u>88.70-98.35'</u>: Packer Test Interval # 6.</p> <p><u>98.35-108.00'</u>: Packer Test Interval # 5.</p> |
| 85 | | | | |
| 90 | | | <p><u>45.4-49.5' SAMPLE.</u> Recovered 4.10/4.10' = 100%. RQD = 3.55/4.10' = 87%.</p> <p>SANDY CLAYSTONE: olive gray (5 Y 4/1) to olive black (5 Y 2/1); sand very fine-grained (3.5-4.0 Ø); well sorted; occasional lenses of a coarser grained sand (3.0-2.5 Ø); pinkish gray (5 YR 8/1) increasing down core when get into sandstone/claystone interbeds; consolidated; hard; at 45.80' have a leaf imprint; occasional organics throughout core; damp.</p> | |
| 95 | | | | |
| 100 | | | | |

LOG OF BOREHOLE

Location _____
Coordinates _____
Total Depth _____

Drilling Company _____
Date Drilled _____
Drilling Method _____
Logged By _____
Geologist

Borehole/Well No. 39-87BR/SP08-87 (con't.)

Ground Surface Elevation _____

Water Level Encountered _____

Static _____

Driller _____

Helper _____

Drilling Fluid _____

Checked By _____

Site Manager

CEARP Manager

Comments _____

| Depth Feet | Graphic Log | Sample Type | Lithologic Description | Samples Collected or Other Tests Performed |
|---------------|----------------|----------------|--|--|
| 100 | | | <p><u>49.5-54.0' SAMPLE.</u> Recovered 4.20/4.50' = 93.30%. RQD = 2.70/3.90' = 69%. 49.5-50.7': SANDY CLAYSTONE: olive gray (5 Y 3/2); cuttings from above; moist. 50.7-54.0': SANDY CLAYSTONE: olive gray (5 Y 4/1) to olive black (5 Y 2/1); same as 45.40-49.50' interval; at 52.25' have some fine-grained sand stained dark yellowish orange (10 YR 6/6); lenses of fine-grained sand increase down core; at 53.5'-54.0' clay is predominant; damp.</p> | <p><u>108.00-117.65'</u>: Packer Test Interval # 4. <u>115.65-125.30'</u>: Packer Test Interval # 3. <u>117.65-127.30'</u>: Packer Test Interval # 2. <u>122.68-132.33'</u>: Packer Test Interval # 1.</p> |
| 105 | | | <p><u>54.0-57.0' SAMPLE.</u> Recovered 3.3/3.0' = 110%. RQD = 2.45/3.30' = 74%. SANDY CLAYSTONE: same as above with nodules of very pale orange (10 YR 8/2) clay and very fine-grained sand increasing down core; at 56.22' have leaf imprint; less fine-grained sand lenses; damp.</p> | |
| 110 | | | <p><u>57.0-61.0' SAMPLE.</u> Recovered 4.0/4.0' = 100%. RQD = 4.0/4.0' = 100%. SANDY CLAYSTONE: same as above with more fine-grained sand lenses; clay nodules still present; more organics than above; clay increases down core with 60.0-61.0' mostly clay; damp.</p> | |
| 115 | | | <p><u>61.0-65.0' SAMPLE.</u> Recovered 0.0/4.0' = 0%. Lost core.</p> | |
| 120 | | | | |

LOG OF BOREHOLE

Location _____
Coordinates _____
Total Depth _____

Borehole/Well No. 39-87BR/SP08-87 (con't.)

Ground Surface Elevation _____

Water Level Encountered _____

Static _____

Drilling Company _____

Driller _____

Date Drilled _____

Helper _____

Drilling Method _____

Drilling Fluid _____

Logged By _____

Checked By _____

Geologist

Site Manager

CEARP Manager

Comments _____

| Depth Feet | Graphic Log | Sample Type | Lithologic Description | Samples Collected or Other Tests Performed |
|---------------|----------------|----------------|---|---|
| 120 | | | <p><u>65.0-66.0' SAMPLE.</u> Recovered 1.5/1.0' = 150%. RQD = 0%. CLAYSTONE: light greenish gray (5 GY 4/1) to dark greenish gray (5 GY 2/1) from 65.0-65.3'; rest of core olive black (5 Y 2/1); trace very fine-grained sand; core mangled from drilling; appears unconsolidated and blocky; damp to moist.</p> | |
| 125 | | | <p><u>66.0-70.0' SAMPLE.</u> Recovered 5.0/4.0' = 125%. RQD = 2.6/5.0' = 52%. 66.0-67.5': CLAYSTONE: olive black (5 Y 2/1) to brownish black (5 YR 2/1); trace silt and very fine-grained sand; some organics; blocky; consolidated; damp. 67.5-68.5': CLAYSTONE: olive black (5 Y 2/1) to brownish black (5 YR 2/1); trace silt and very fine-grained sand; some organics; blocky; consolidated; damp. 68.5-69.5': CLAYSTONE: olive black (5 Y 2/1) to greenish black (5 GY 2/1) to black (N 1/0); trace silt; blocky; damp. 69.5-70.0': CLAYSTONE: medium bluish gray (5 B 5/1) to medium gray (N 5/0); highly plastic; block; moist.</p> | |
| 130 | | | | |
| 135 | | | <p><u>70.0-74.0' SAMPLE.</u> Recovered 0.6/4.0' = 15%. RQD = 0%. CLAYSTONE: olive black (5 Y 2/1) to medium dark gray (N 4/0); blocky; homogenous; plastic; damp.</p> | |
| 140 | | | | |

LOG OF BOREHOLE

Location _____
Coordinates _____
Total Depth _____

Borehole/Well No. 39-87BR/SP08-87 (con't.)

Ground Surface Elevation _____

Water Level Encountered _____

Static _____

Drilling Company _____

Driller _____

Date Drilled _____

Helper _____

Drilling Method _____

Drilling Fluid _____

Logged By _____

Checked By _____

Geologist

Site Manager

CEARP Manager

Comments _____

| Depth Feet | Graphic Log | Sample Type | Lithologic Description | Samples Collected or Other Tests Performed |
|---------------|----------------|----------------|--|---|
| | | | <u>74.0-76.0' SAMPLE.</u> Recovered 3.85/2.0' = 193%. RQD = 2.26/3.85' = 59%. Picked up 1.85' from previous run. 72.15-74.0': CLAYSTONE: olive black (5 Y 2/1) with lenses of black (N 1/0); blocky, homogenous; plastic; damp. 74.0-76.0': CLAYSTONE: olive black (5 Y 2/1) to medium gray (N 5/0), blocky, homogenous; plastic; damp. | |
| | | | <u>76.0-80.0' SAMPLE.</u> Recovered 2.13/4.0' = 53%. RQD = 1.50/2.13' = 70%. CLAYSTONE: olive black (5 Y 2/1); some silt; some organics; trace very fine-grained sand interbeds; homogenous; blocky; medium hardness; damp. | |
| | | | <u>80.0-82.0' SAMPLE.</u> Recovered 2.62/2.01 = 131%. RQD = 1.62/2.62' = 62%. SANDY CLAYSTONE: olive black (5 Y 2/1); some very fine-grained sand, poorly sorted, subangular to subrounded fine-grained sand occurring in lenses and interbeds; some silt; some organics; small coal seams; blocky; fairly homogenous; medium hardness; damp. | |

LOG OF BOREHOLE

Location _____
Coordinates _____
Total Depth _____

Borehole/Well No. 39-87BR/SP08-87 (con't.)
Ground Surface Elevation _____
Water Level Encountered _____
Static _____

Drilling Company _____
Date Drilled _____
Drilling Method _____
Logged By _____
Geologist

Driller _____
Helper _____
Drilling Fluid _____
Checked By _____
Site Manager
CEARP Manager

Comments _____

| Depth Feet | Graphic Log | Sample Type | Lithologic Description | Samples Collected or Other Tests Performed |
|---------------|----------------|----------------|--|---|
| | | | <p><u>82.0-84.0' SAMPLE.</u> Recovered 2.38/2.0' = 119%. RQD = 2.15/2.38' = 90%. SANDY CLAYSTONE/CLAYEY SAND- STONE INTERBEDS: olive black (5 Y 2/1) to dark gray (N 3/0); sand very fine- grained to fine-grained, poorly sorted, occurs in lenses and interbeds; occasional stringers of coal in small fractures with no orientation; some silt; some organics; consolidated; medium hardness; from 83.0-84.0' have small lenses of fairly well sorted fine-grained (3.0-2.5 Ø) sand, subrounded; quartzitic, yellowish gray (5 Y 8/1); damp with sand lenses moist.</p> <p><u>84.0-86.0' SAMPLE.</u> Recovered 2.0/2.0' = 100%. RQD = 1.76/2.0' = 86%. SANDY CLAYSTONE: olive black (5 Y 2/1) to dark gray (N 3/0) with yellowish gray (5 Y 8/1) fine-grained sand lenses occasional, poorly sorted; occasional stringers of coal; some silt; some organics; consolidated; damp.</p> <p><u>86.0-88.0' SAMPLE.</u> Recovered 2.0/2.0' = 100%. RQD = 2.0/2.0' = 100%. SANDY SILTSTONE: same as above except less sand; no coal stringers; damp.</p> | |

LOG OF BOREHOLE

Location _____
Coordinates _____
Total Depth _____

Drilling Company _____
Date Drilled _____
Drilling Method _____
Logged By _____
Geologist

Borehole/Well No. 39-87BR/SP08-87 (con't.)

Ground Surface Elevation _____

Water Level Encountered _____

Static _____

Driller _____

Helper _____

Drilling Fluid _____

Checked By _____

Site Manager

CEARP Manager

Comments _____

| Depth Feet | Graphic Log | Sample Type | Lithologic Description | Samples Collected or Other Tests Performed |
|---------------|----------------|----------------|--|---|
| | | | <u>88.0-92.0' SAMPLE.</u> Recovered 4.0/4.0' = 100%. RQD = 3.63/4.0' = 91%. 88.0-91.0': SANDY SILTSTONE: olive black (5 Y 2/1) and dark gray (N 3/0); some clay; lots of silt; some very fine-grained fairly well sorted sand with lenses of a fine-grained, well sorted sand; damp. 91.0-92.0': SILTY SANDSTONE: olive black (5 Y 2/1) with yellowish gray (5 Y 8/1) to pinkish gray (5 YR 8/1) fine-grained sand, fairly well sorted; sand in lenses and interbeds; some clay; some organics; small planes of lamination present in sand lenses; consolidated; damp. | |
| | | | <u>92.0-96.0' SAMPLE.</u> Recovered 4.0/4.0' = 100%. RQD = 3.83/4.0' = 96%. 92.0-94.25': SILTY SANDSTONE: olive black (5 Y 2/1) to yellowish gray (5 Y 8/1); very fine-grained to fine-grained sand, fairly well sorted; some planes of lamination; less silt and clay than above; some occasional organics; consolidated; damp. 94.25-95.2': SANDY SILTSTONE/SILTY SANDSTONE: same as above with finer-grained sand; damp. 95.2-96.0': SILTY SANDSTONE: same as 92.0-94.25'; damp. | |

LOG OF BOREHOLE

Location _____
Coordinates _____
Total Depth _____

Borehole/Well No. 39-87BR/SP08-87 (con't.)

Ground Surface Elevation _____

Water Level Encountered _____

Static _____

Drilling Company _____

Driller _____

Date Drilled _____

Helper _____

Drilling Method _____

Drilling Fluid _____

Logged By _____

Checked By _____

Geologist

Site Manager

CEARP Manager

Comments _____

| Depth Feet | Graphic Log | Sample Type | Lithologic Description | Samples Collected or Other Tests Performed |
|---------------|----------------|----------------|--|---|
| | | | <u>96.0-100.0' SAMPLE.</u> Recovered 4.3/4.0' = 107%. ROD = 4.0/4.3' = 93%. 96.0-97.35': SANDY SILTSTONE: olive black (5 Y 2/1); very fine-grained sand, fairly well sorted in siltstone matrix; some clay; some organics; some lamination planes; consolidated; at 96.10-96.50' and 97.2-97.35' have lenses of a light olive gray (5 Y 6/1) to olive black (5 Y 2/1), fairly well sorted, moist, fine-grained sand; damp. 97.35-99.0': SILTSTONE: olive black (5 Y 2/1); very fine-grained sand yielding to claystone downcore and disappearing at 98.85'; consolidated; some clay; lots silt; occasional nodules of grayish orange (10 YR 7/4) clay, prominent from 97.35-98.0'; some organics; damp. 99.0-100.0': CLAYEY SILTSTONE: olive black (5 Y 2/1); trace very fine-grained sand; lots of silt; lots of clay; consolidated; some organics; occasional grayish orange (10 YR 7/4) nodules of clay; damp. | |

LOG OF BOREHOLE

Location _____
Coordinates _____
Total Depth _____

Borehole/Well No. 39-87BR/SP08-87 (con't.)

Ground Surface Elevation _____

Water Level Encountered _____

Static _____

Drilling Company _____

Driller _____

Date Drilled _____

Helper _____

Drilling Method _____

Drilling Fluid _____

Logged By _____

Checked By _____

Geologist

Site Manager

CEARP Manager

Comments _____

| Depth Feet | Graphic Log | Sample Type | Lithologic Description | Samples Collected or Other Tests Performed |
|---------------|----------------|----------------|---|---|
| | | | <u>100.0-104.0' SAMPLE.</u> Recovered 2.61/4.0' = 65.3%. RQD = 2.50/2.61' = 96%. 100.0-101.0': CLAYEY SILTSTONE: olive black (5 Y 2/1); trace very fine-grained sand; fairly homogenous; consolidated; damp. 101.0-101.5': SILTY SANDSTONE: yellowish gray (5 Y 8/1) to olive black (5 Y 2/1); sand from very fine-grained in upper portion to fine-grained in lower portion fairly well sorted, subrounded; some silt; little clay; consolidated; damp to moist. 101.5-102.61': CLAYSTONE: medium dark gray (N 4/0) to dark gray (N 3/0); highly plastic; blocky; homogenous; no silt or sand; damp to moist. | |
| | | | <u>104.0-108.0' SAMPLE.</u> Recovered 4.0/4.0' = 100%. RQD = 3.27/4.0' = 82%. CLAYSTONE: olive black (5 Y 2/1) to dark gray (N 3/0); trace silt; blocky; homogenous; damp to moist. | |

LOG OF BOREHOLE

Location _____
Coordinates _____
Total Depth _____

Borehole/Well No. 39-87BR/SP08-87 (con't.)

Ground Surface Elevation _____

Water Level Encountered _____

Static _____

Drilling Company _____

Driller _____

Date Drilled _____

Helper _____

Drilling Method _____

Drilling Fluid _____

Logged By _____

Checked By _____

Geologist

Site Manager

CEARP Manager

Comments _____

| Depth Feet | Graphic Log | Sample Type | Lithologic Description | Samples Collected or Other Tests Performed |
|---------------|----------------|----------------|--|---|
| | | | <p><u>108.0-112.0' SAMPLE.</u> Recovered 3.9/4.0' = 98%. RQD = 3.49/3.9' = 89.5%. 108.0-110.0': SILTSTONE: olive black (5 Y 2/1); some very fine-grained sand; some clay; some organics; fairly homogenous; consolidated; hard; more sand down core; damp. 110.0-111.90': SANDSTONE: dark greenish gray (5 G 4/1) to greenish gray (5 GY 6/1) with some yellowish gray (5 Y 8/1); very fine-grained (3.5-4.0 Ø) to fine-grained (3.0-2.5 Ø); fairly well sorted; subangular to subrounded; some silt; trace clay; some leaf and plant stem organics, increases down core; sand fines as goes down core with occasional lenses of the coarser grains; massive; damp to moist.</p> | |

LOG OF BOREHOLE

Location _____
Coordinates _____
Total Depth _____

Borehole/Well No. 39-87BR/SP08-87 (con't.)

Ground Surface Elevation _____

Water Level Encountered _____

Static _____

Drilling Company _____

Driller _____

Date Drilled _____

Helper _____

Drilling Method _____

Drilling Fluid _____

Logged By _____

Checked By _____

Geologist

Site Manager

CEARP Manager

Comments _____

| Depth Feet | Graphic Log | Sample Type | Lithologic Description | Samples Collected or Other Tests Performed |
|---------------|----------------|----------------|---|---|
| | | | <u>112.0-116.0' SAMPLE.</u> Recovered 4.67/4.0' = 117%. RQD = 3.23/4.67' = 69%. 112.0-112.5': SANDY SILTSTONE: olive black (5 Y 2/1); 40% silt; 40% organics; 20% sand; consolidated; damp to moist. 112.5-115.75': SANDSTONE: greenish gray (5 GY 6/1) to dark greenish gray (5 G 4/1) with some yellowish gray (5 Y 8/1); fine-grained (3.0-2.0 Ø) to medium- grained (2.0-1.5 Ø) sand, fining down core; occasional lenses of clay and silt associated with organics occurring throughout the core; sand massive with zones of contorted bedding; consolidated; at 112.75' have a fracture of coal with small fractures of coal or organics occur- ring throughout the core; damp to moist. 115.75-116.0': SILTY SANDSTONE: olive black (5 Y 2/1); very silty; sand fine- grained to medium-grained as above. occurring in lenses; many organics with clay associated; very hard; consolidated; damp. | |

LOG OF BOREHOLE

Location _____
Coordinates _____
Total Depth _____

Borehole/Well No. 39-87BR/SP08-87 (con't.)

Ground Surface Elevation _____

Water Level Encountered _____

Static _____

Drilling Company _____

Driller _____

Date Drilled _____

Helper _____

Drilling Method _____

Drilling Fluid _____

Logged By _____

Checked By _____

Geologist

Site Manager

CEARP Manager

Comments _____

| Depth Feet | Graphic Log | Sample Type | Lithologic Description | Samples Collected or Other Tests Performed |
|---------------|----------------|----------------|--|---|
| | | | <u>116.0-120.0' SAMPLE.</u> Recovered 2.0/4.0' = 50%. RQD = 0.45/2.0' = 22.5%. 116.0-116.3': CUTTINGS OF SILTSTONE AND CLAYSTONE: reworked. 116.3-116.9': SANDY SILTSTONE: olive black (5 Y 2/1) with yellowish gray (5 Y 8/1) and greenish gray (5GY 6/1) fine- grained sand in lenses; some clay; some organics; massive; consolidated; damp to moist. 116.9-118.0': CLAYEY SANDY SILT- STONE: olive black (5 Y 2/1); heavy silt influence; sand is very fine-grained; some organics; massive; consolidated; damp. | |

LOG OF BOREHOLE

Location _____
Coordinates _____
Total Depth _____

Drilling Company _____
Date Drilled _____
Drilling Method _____
Logged By _____
Geologist

Borehole/Well No. 39-87BR/SP08-87 (con't.)
Ground Surface Elevation _____
Water Level Encountered _____
Static _____

Driller _____
Helper _____
Drilling Fluid _____
Checked By _____
Site Manager
CEARP Manager

Comments _____

| Depth Feet | Graphic Log | Sample Type | Lithologic Description | Samples Collected or Other Tests Performed |
|---------------|----------------|----------------|---|---|
| | | | <p><u>120.0-122.0' SAMPLE.</u> Recovered 4.6/2.0' = 230%. RQD 3.97/4.6' = 86%. 118.0-120.0': CLAYEY SILTSTONE: olive black (5 Y 2/1) to greenish black (5 GY 2/1); trace very fine-grained sand; some organics; occasional seams of coal; massive; blocky; fairly homogenous; consolidated; damp. 120.0-121.4': CLAYEY SILTSTONE: dark greenish gray (5 G 4/1) to greenish black (5 GY 2/1); trace very fine-grained sand in lenses; some organics; massive; consolidated; damp. 121.4-122.0': SANDSTONE: dark greenish gray (5 G 4/1) to greenish black (5 GY 2/1); some silt in top of core giving way to sand; fine-grained to medium-grained (2.0-1.5 Ø) sand, subrounded to subangular; feldspathic and quartzitic; fairly well sorted; massive; homogenous; consolidated; few organics; damp to moist.</p> | |

LOG OF BOREHOLE

Location _____
Coordinates _____
Total Depth _____

Borehole/Well No. 39-87BR/SP08-87 (con't.)

Ground Surface Elevation _____

Water Level Encountered _____

Static _____

Drilling Company _____

Driller _____

Date Drilled _____

Helper _____

Drilling Method _____

Drilling Fluid _____

Logged By _____

Checked By _____

Geologist

Site Manager

CEARP Manager

Comments _____

| Depth Feet | Graphic Log | Sample Type | Lithologic Description | Samples Collected or Other Tests Performed |
|---------------|----------------|----------------|--|---|
| | | | <u>122.0-126.0' SAMPLE.</u> Recovered 4.0/4.0' = 100%. RQD = 3.65/4.0' = 91%. 122.0-122.85': SANDSTONE: greenish gray (5 G 6/1) to greenish black (5 G 2/1); some silt; fine-grained to medium-grained (2.5-1.5 Ø) sand, subrounded to subangular, fairly well sorted; some organics; massive; consolidated; moist. 122.85-126.0': SANDSTONE/SILTSTONE: greenish gray (5 G 6/1) to greenish black (5 G 2/1); very fine-grained sand with lenses of fine-grained to medium-grained sand as above (122.0-122.85'); some organics more than above; clay influence with organics; sand decreases down core giving way to more silt, a little clay, and more organics; massive; consolidated; damp. | |
| | | | <u>126.0-130.0' SAMPLE.</u> Recovered 1.5/4.0' = 37.5%. RQD = 0.75/1.5' = 50%. SANDSTONE: medium dark gray (N 4/0) to light gray (N 7/0); very fine-grained to fine-grained (3.5-2.5 Ø) feldspathic and quartzitic sand; fairly well sorted; massive; occasional trace lamination planes; sand fines down core; some organics; some silt; from 127.3-127.5' have zone of clay influence; moist to wet. | |

LOG OF BOREHOLE

Location _____
Coordinates _____
Total Depth _____

Drilling Company _____
Date Drilled _____
Drilling Method _____
Logged By _____
Geologist

Borehole/Well No. 39-87BR/SP08-87 (con't.)

Ground Surface Elevation _____

Water Level Encountered _____

Static _____

Driller _____

Helper _____

Drilling Fluid _____

Checked By _____

Site Manager

CEARP Manager

Comments _____

| Depth Feet | Graphic Log | Sample Type | Lithologic Description | Samples Collected or Other Tests Performed |
|---------------|----------------|----------------|---|---|
| | | | <p><u>130.0-132.0' SAMPLE.</u> Recovered $4.35/2.0' = 217.5\%$. RQD = $3.68/4.35' = 84.6\%$. 127.5-129.4': CLAYEY SILTSTONE: dark greenish gray (5 G 4/1) to greenish black (5 G 2/1); no organics, hard; massive; fairly homogenous; consolidated; damp to dry. 129.4-129.7': SILTY CLAYSTONE: same as above; damp to dry. 129.7-130.0': SILTY SANDSTONE: same as above with some clay; very fine-grained sand; moist. 130.0-132.0': SILTY SANDSTONE: dark greenish gray (5 G 4/1) to greenish gray (5 G 6/1); very fine-grained (3.5-4.0 Ø) to fine-grained (3.0-2.5 Ø), fairly well sorted sand; some silt; massive; consolidated; damp to moist.</p> <p><u>132.0-136.0' SAMPLE</u> Recovered $4.18/4.0' = 104.5\%$. RQD = $3.76/4.18' = 90\%$. 132.0-132.4': SANDSTONE: dark greenish gray (5 G 4/1) to greenish gray (5 G 6/1); fine-grained (2.0-3.0 Ø) sand; fairly well sorted; some silt; massive; consolidated; damp. 132.4-136.0': SILTY CLAYSTONE: dark greenish gray (5 G 4/1) to greenish gray (5 G 6/1); trace very fine-grained sand; silt in top of core gives way to clay down core; fairly homogenous; massive; consolidated; hard; no organics; damp.</p> | |

LOG OF BOREHOLE

Location _____
Coordinates _____
Total Depth _____

Drilling Company _____
Date Drilled _____
Drilling Method _____
Logged By _____
Geologist

Borehole/Well No. 39-87BR/SP08-87 (con't.)

Ground Surface Elevation _____
Water Level Encountered _____
Static _____

Driller _____
Helper _____
Drilling Fluid _____
Checked By _____

Site Manager

CEARP Manager

Comments _____

| Depth Feet | Graphic Log | Sample Type | Lithologic Description | Samples Collected or Other Tests Performed |
|---------------|----------------|----------------|---|---|
| | | | <p><u>136.0-140.0' SAMPLE.</u> Recovered 2.0/4.0' = 50%. RQD = 0.6/2.0' = 30%. CLAYSTONE: medium gray (N 5/0) to dark gray (N 3/0); some silt; homogenous; massive; blocky; no organics; damp.</p> <p>TOTAL DEPTH: 140.00'.</p> | |

WELL COMPLETION INFORMATION

Location Rocky Flats Plant; Solar Ponds Area

Well No. 39-87BR/SP08-87

Coordinates N 38094.04 E 22166.32

Elevation: Ground Surface 5947.10'

Total Depth: Well 117.39'

Top of Casing 5949.12'

Borehole 140.00'

Formation of Completion Arapahoe Formation

Casing Material Sch 5, Type 316, TFJ Stainless Steel

Casing Diameter 2" ID

Screen Material 0.010" wire wrap, Type 316, TFJ Stainless Steel

Surface Casing Diameter 5" ID

Date Installed November 17-18, 1987

Approved By _____

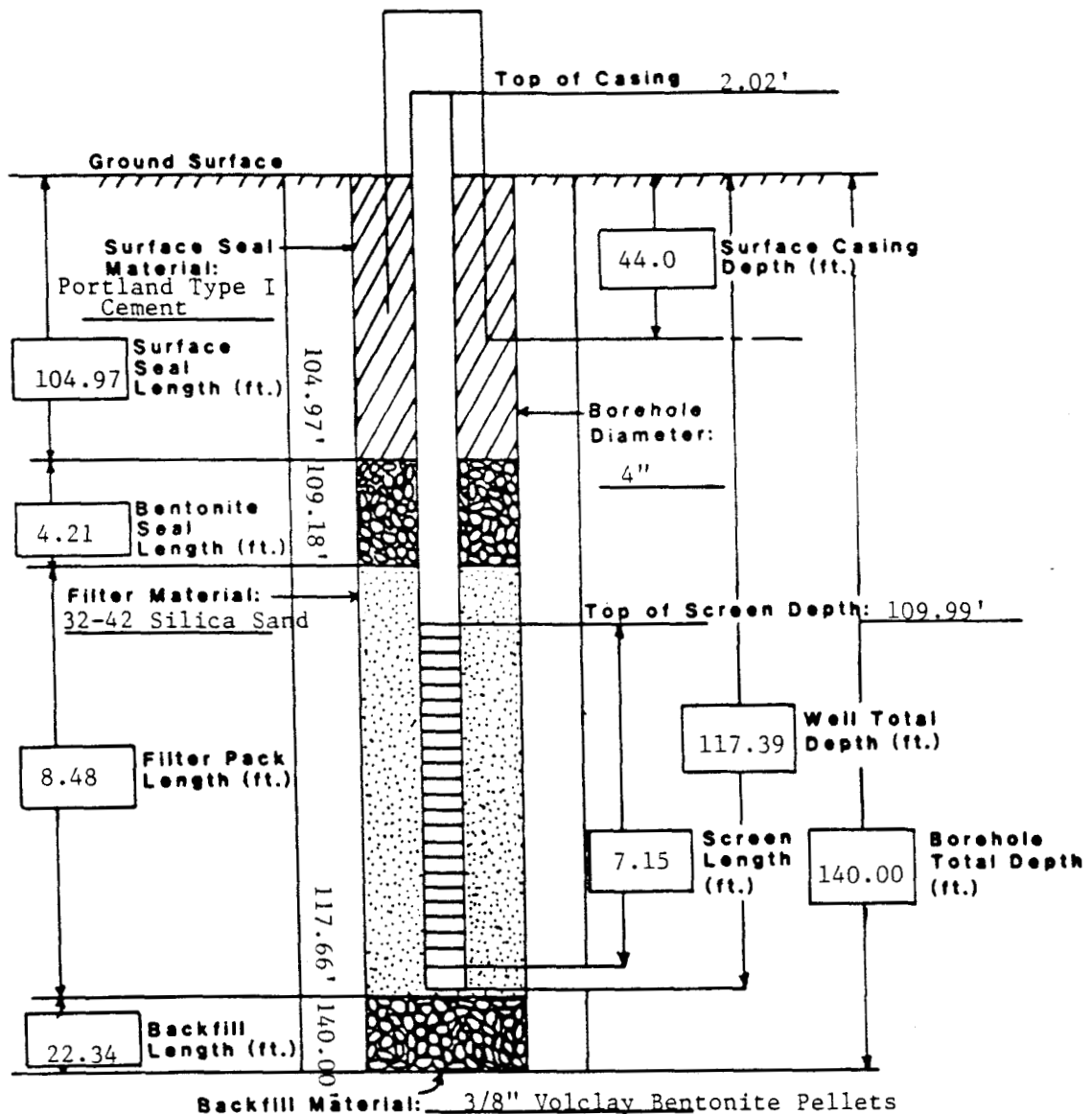
Installed By K.D. Holliway

Site Manager

Geologist

CEARP Manager

Comments Surface casing set to 44.0' by R. Treat on October 30, 1987.



Well No.: 39-87BR

WELL DEVELOPMENT SUMMARY SHEET

[illegible]

PACKER TEST DATA SHEET

Job No.: 2029-17-02 Static Water Level: 83.98'
 Location: Rocky Flats Plant; Solar Ponds Area Date of Water Level: 4/18/88
 Well No.: 39-87BR Page 1 of 2
 Borehole Diameter: 0.333' Comments: Interval #2 (117.65 - 127.30') failed
 Acrylic Tube Diameter: 0.1663'

| Test Interval No. | Top of Test Interval | Bottom of Test Interval | Test Length (minutes) | Gage Pressure | Gage Height | Avg. H ₂ O Height | Gage Height + Avg. H ₂ O Height | Δh | Date of Test | Lithology | Geologist |
|-------------------|----------------------|-------------------------|-----------------------|---------------|-------------|------------------------------|--|--------|--------------|-----------|-----------|
| 1 | 122.68 | 132.33 | 15 | 0 | 5.90 | 4.25 | 10.15 | 0.03 | 11/11/87 | Kass | KDH |
| | | | 15 | 29.7 | 5.90 | - | 5.90 | 0.12 | 11/11/87 | Kass | KDH |
| | | | 15 | 0 | 5.90 | 2.712 | 8.702 | -0.02 | 11/11/87 | Kass | KDH |
| 3 | 115.65 | 125.30 | 15 | 0 | 5.90 | 3.94 | 9.84 | -0.08 | 11/11/87 | Kass | KDH |
| | | | 15 | 28 | 5.90 | - | 5.90 | 1.21 | 11/11/87 | Kass | KDH |
| | | | 15 | 0 | 5.90 | 2.528 | 8.428 | -0.095 | 11/11/87 | Kass | KDH |
| 4 | 108.00 | 117.65 | 15 | 0 | 5.90 | 4.172 | 10.162 | -0.025 | 11/11/87 | Kass | KDH |
| | | | 15 | 26 | 5.90 | - | 5.90 | 0.18 | 11/11/87 | Kass | KDH |
| | | | 15 | 0 | 5.90 | 3.558 | 9.458 | -0.01 | 11/11/87 | Kass | KDH |
| 5 | 98.35 | 108.00 | 15 | 0 | 5.90 | 3.904 | 9.804 | -0.01 | 11/12/87 | KCL | KDH |
| | | | 15 | 24 | 5.90 | - | 5.90 | 0.11 | 11/12/87 | KCL | KDH |
| | | | 15 | 0 | 5.90 | 2.519 | 8.419 | -0.035 | 11/12/87 | KCL | KDH |
| 6 | 88.70 | 98.35 | 15 | 0 | 5.90 | 5.638 | 11.538 | -0.010 | 11/12/87 | KCL | KDH |
| | | | 15 | 21.7 | 5.90 | - | 5.90 | 0.07 | 11/12/87 | KCL | KDH |
| | | | 15 | 0 | 5.90 | 5.537 | 11.437 | -0.015 | 11/12/87 | KCL | KDH |
| 7 | 79.05 | 88.70 | 15 | 0 | 5.90 | 4.437 | 10.337 | 0.02 | 11/12/87 | KCL | KDH |
| | | | 15 | 19.4 | 5.90 | - | 5.90 | 0.08 | 11/12/87 | KCL | KDH |
| | | | 15 | 0 | 5.90 | 4.228 | 10.128 | -0.015 | 11/12/87 | KCL | KDH |

PACKER TEST DATA SHEET

Job No.: 2029-17-02

Location: Rocky Flats Plant; Solar Ponds Area

Well No.: 39-87BR (cont'd.)

Borehole Diameter:

Acrylic Tube Diameter:

Static Water Level:

Date of Water Level:

Page 2 of 2

Comments:

[illegible]

PACKER TEST ANALYSIS

WELL NO. 39-87BR

ROCKY FLATS PLANT; SOLAR POND AREA JOB NO. 2029-17-02

DATE TESTED: 11/12/87 BY: KD HOLLIWAY

TEST INTERVAL (FEET BELOW G.S.): 50.10 - 59.75

MATERIAL TESTED: ARAPAHOE CLAYSTONE

DEPTH TO WATER (FEET BELOW G.S.): 83.98

$$K = \frac{Q}{2(\pi)(L)(H)} \ln\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

TEST ABORTED

P2/3 TEST

Q = INJECTION RATE = .00007240 (FEET³/MIN)

L = LENGTH OF TEST INTERVAL = 9.65 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 54.92 + 5.90 + 15.08 * 2.31 = 95.66

R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000005 FT/MIN

K = .00000003 CM/SEC

2ND P1/3 TEST

TEST ABORTED

PACKER TEST ANALYSIS

WELL NO. 39-87BR

ROCKY FLATS PLANT; SOLAR POND AREA JOB NO. 2029-17-02

DATE TESTED: 11/12/87 BY: KD HOLLIWAY

TEST INTERVAL (FEET BELOW G.S.): 59.75 - 69.40

MATERIAL TESTED: ARAPAHOE CLAYSTONE

DEPTH TO WATER (FEET BELOW G.S.): 83.98

$$K = \frac{Q}{2(\pi)(L)(H)} \ln\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00000000 (FEET³/MIN)

L = LENGTH OF TEST INTERVAL = 9.65 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 64.57 + 9.96 + .00 * 2.31 = 74.53

R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000000 FT/MIN

K = .00000000 CM/SEC

NOTE: NO WATER GAIN OR LOSS IN INJECTION TUBE;

Q=0

P2/3 TEST

Q = INJECTION RATE = .00018825 (FEET³/MIN)

L = LENGTH OF TEST INTERVAL = 9.65 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 64.57 + 5.90 + 14.80 * 2.31 = 104.66

R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000012 FT/MIN

K = .00000006 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00000000 (FEET³/MIN)

L = LENGTH OF TEST INTERVAL = 9.65 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 64.57 + 8.71 + .00 * 2.31 = 73.28

R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000000 FT/MIN

K = .00000000 CM/SEC

NOTE: NO WATER GAIN OR LOSS IN INJECTION TUBE

Q=0

PACKER TEST ANALYSIS
 WELL NO. 39-87BR
 ROCKY FLATS PLANT; SOLAR POND AREA JOB NO. 2029-17-02
 DATE TESTED: 11/12/87 BY: KD HOLLIWAY
 TEST INTERVAL (FEET BELOW G.S.): 69.40 - 79.05
 MATERIAL TESTED: ARAPAHOE CLAYSTONE
 DEPTH TO WATER (FEET BELOW G.S.): 83.98

$$K = \frac{Q}{2(\pi)(L)(H)} \ln\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00000000 (FEET3/MIN)
 L = LENGTH OF TEST INTERVAL = 9.65 FEET
 TEST INTERVAL IS ABOVE WATER TABLE
 HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
 + GAGE PRESSURE (IN FEET)
 = 74.23 + 9.58 + .00 * 2.31 = 83.81
 R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000000 FT/MIN
 K = .00000000 CM/SEC

NOTE: NO WATER GAIN OR LOSS IN INJECTION TUBE;
 Q=0

P2/3 TEST

Q = INJECTION RATE = .00014480 (FEET3/MIN)
 L = LENGTH OF TEST INTERVAL = 9.65 FEET
 TEST INTERVAL IS ABOVE WATER TABLE
 HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
 + GAGE PRESSURE (IN FEET)
 = 74.23 + 5.90 + 17.10 * 2.31 = 119.63
 R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000008 FT/MIN
 K = .00000004 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00000000 (FEET3/MIN)
 L = LENGTH OF TEST INTERVAL = 9.65 FEET
 TEST INTERVAL IS ABOVE WATER TABLE
 HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
 + GAGE PRESSURE (IN FEET)
 = 74.23 + 7.66 + .00 * 2.31 = 81.89
 R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000000 FT/MIN
 K = .00000000 CM/SEC

NOTE: NO WATER GAIN OR LOSS IN INJECTION TUBE;
 Q=0

PACKER TEST ANALYSIS

WELL NO. 39-87BR

ROCKY FLATS PLANT; SOLAR POND AREA JOB NO. 2029-17-02

DATE TESTED: 11/12/87 BY: KD HOLLIWAY

TEST INTERVAL (FEET BELOW G.S.): 79.05 - 88.70

MATERIAL TESTED: ARAPAHOE CLAYSTONE

DEPTH TO WATER (FEET BELOW G.S.): 83.98

$$K = \frac{Q}{2(Pi)(L)(H)} \frac{L}{LN(\frac{L}{R})}$$

1ST P1/3 TEST

Q = INJECTION RATE = .00002896 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 9.65 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 83.88 + 10.34 + .00 * 2.31 = 94.21

R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000002 FT/MIN

K = .00000001 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00011584 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 9.65 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 83.88 + 5.90 + 19.40 * 2.31 = 134.59

R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000006 FT/MIN

K = .00000003 CM/SEC

2ND P1/3 TEST

TEST ABORTED

PACKER TEST ANALYSIS

WELL NO. 39-87BR

ROCKY FLATS PLANT; SOLAR POND AREA JOB NO. 2029-17-02

DATE TESTED: 11/12/87 BY: KD HOLLIWAY

TEST INTERVAL (FEET BELOW G.S.): 88.70 - 98.35

MATERIAL TESTED: ARAPAHOE CLAYSTONE

DEPTH TO WATER (FEET BELOW G.S.): 83.98

$$K = \frac{Q}{2(P_i)(L)(H)} \ln\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

TEST ABORTED

P2/3 TEST

Q = INJECTION RATE = .00010136 (FEET³/MIN)

L = LENGTH OF TEST INTERVAL = 9.65 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 83.98 + 5.90 + 21.70 * 2.31 = 140.01

R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000005 FT/MIN

K = .00000002 CM/SEC

2ND P1/3 TEST

TEST ABORTED

PACKER TEST ANALYSIS

WELL NO. 39-87BR

ROCKY FLATS PLANT; SOLAR POND AREA JOB NO. 2029-17-02

DATE TESTED: 11/12/87 BY: KD HOLLIWAY

TEST INTERVAL (FEET BELOW G.S.): 98.35 - 108.00

MATERIAL TESTED: ARAPAHOE CLAYSTONE

DEPTH TO WATER (FEET BELOW G.S.): 83.98

$$K = \frac{Q}{2(\pi)(L)(H)} \ln\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

TEST ABORTED

P2/3 TEST

Q = INJECTION RATE = .00015929 (FEET³/MIN)

L = LENGTH OF TEST INTERVAL = 9.65 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 83.98 + 5.90 + 24.00 * 2.31 = 145.32

R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000007 FT/MIN

K = .00000004 CM/SEC

2ND P1/3 TEST

TEST ABORTED

PACKER TEST ANALYSIS

WELL NO. 39-87BR

ROCKY FLATS PLANT; SOLAR POND AREA JOB NO. 2029-17-02

DATE TESTED: 11/11/87 BY: KD HOLLIWAY

TEST INTERVAL (FEET BELOW G.S.): 108.00 - 117.65

MATERIAL TESTED: ARAPAHOE SANDSTONE

DEPTH TO WATER (FEET BELOW G.S.): 83.98

$$K = \frac{Q}{2(\pi)(L)(H)} \ln\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

TEST ABORTED

P2/3 TEST

Q = INJECTION RATE = .00026065 (FEET³/MIN)

L = LENGTH OF TEST INTERVAL = 9.65 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 83.98 + 5.90 + 26.00 * 2.31 = 149.94

R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000012 FT/MIN

K = .00000006 CM/SEC

2ND P1/3 TEST

TEST ABORTED

PACKER TEST ANALYSIS

WELL NO. 39-87BR

ROCKY FLATS PLANT; SOLAR POND AREA JOB NO. 2029-17-02

DATE TESTED: 11/11/87 BY: KD HOLLIWAY

TEST INTERVAL (FEET BELOW G.S.): 115.65 - 125.30

MATERIAL TESTED: ARAPAHOE SANDSTONE

DEPTH TO WATER (FEET BELOW G.S.): 83.98

$$K = \frac{Q}{2(\pi)(L)(H)} \ln\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

TEST ABORTED

P2/3 TEST

Q = INJECTION RATE = .00175214 (FEET³/MIN)

L = LENGTH OF TEST INTERVAL = 9.65 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 83.98 + 5.90 + 28.00 * 2.31 = 154.56

R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000076 FT/MIN

K = .00000039 CM/SEC

2ND P1/3 TEST

TEST ABORTED

PACKER TEST ANALYSIS

WELL NO. 39-87BR

ROCKY FLATS PLANT; SOLAR POND AREA JOB NO. 2029-17-02

DATE TESTED: 11/11/87 BY: KD HOLLIWAY

TEST INTERVAL (FEET BELOW G.S.): 122.68 - 132.33

MATERIAL TESTED: ARAPAHOE SANDSTONE

DEPTH TO WATER (FEET BELOW G.S.): 83.98

$$K = \frac{Q}{2(\pi)(L)(H)} \ln\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00004344 (FEET³/MIN)

L = LENGTH OF TEST INTERVAL = 9.65 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 83.98 + 10.15 + .00 * 2.31 = 94.13

R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000003 FT/MIN

K = .00000002 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00017377 (FEET³/MIN)

L = LENGTH OF TEST INTERVAL = 9.65 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 83.98 + 5.90 + 29.70 * 2.31 = 158.49

R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000007 FT/MIN

K = .00000004 CM/SEC

2ND P1/3 TEST

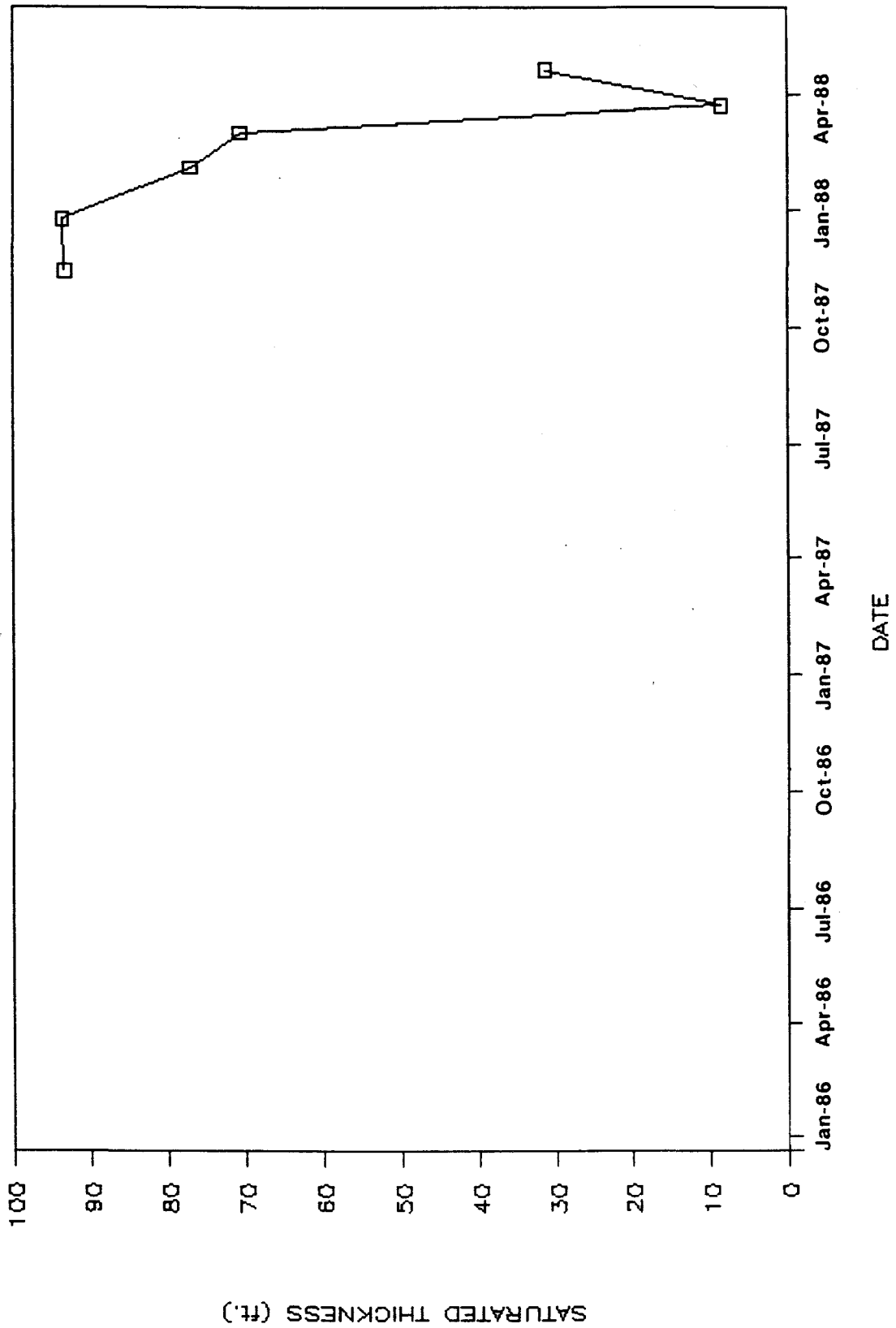
TEST ABORTED

ROCKY FLATS SOLAR PONDS

WATER LEVEL SUMMARY

| <u>WELL</u> <u>NUMBER</u> | <u>DATE</u> | <u>GROUND</u> <u>SURFACE</u> <u>ELEVATION</u> | <u>TOP OF</u> <u>CASING</u> <u>ELEVATION</u> | <u>STICK</u> <u>UP</u> | <u>DEPTH</u> <u>OF SI</u> <u>BASE</u> | <u>WATER</u> <u>DEPTH</u> <u>BELOW TOC</u> | <u>WATER</u> <u>SURFACE</u> <u>ELEVATION</u> |
|------------------------------|-------------|---|--|---------------------------|---|--|--|
| 3987 | 11/12/87 | 5947.10 | 5949.12 | 2.02 | 117.14 | 23.90 | 5925.22 |
| | 12/22/87 | | | | | 23.60 | 5925.52 |
| | 02/01/88 | | | | | 40.20 | 5908.92 |
| | 02/29/88 | | | | | 46.60 | 5902.52 |
| | 03/21/88 | | | | | 108.6 | 5840.52 |
| | 04/18/88 | | | | | 86.00 | 5863.12 |

SATURATED THICKNESS IN WELL # 39-87 (SP)



INDEX OF DATA

Boring No.: 56-87 /SP16-87

Completed as well? Yes

Data in File

- X Log of Borehole
- X Well Construction Summaries
- X Well Development Summaries
- Hydraulic Conductivity Test Data
and Results
- Packer Test Data and Results
- X Water Level Data
- X Saturated Thickness Hydrographs

LOG OF BOREHOLE

Location Rocky Flats Plant; Solar Pond Area
Coordinates N 37654.23 E 21319.10
Total Depth 13.40'

Borehole/Well No. 56-87/SP16-87
Ground Surface Elevation 5978.51'
Water Level Encountered None

Drilling Company Boyles Bros.
Date Drilled January 7, 1988
Drilling Method Hollow Stem Auger
Logged By KD Holliday
Geologist

Static _____
Driller T. High
Helper B. Keeney
Drilling Fluid None
Checked By _____
Site Manager
CEARP Manager

Comments _____

| Depth Feet | Graphic Log | Sample Type | Lithologic Description | Samples Collected or Other Tests Performed |
|---------------|----------------|----------------|---|--|
| 0 | | | TOP SOIL | |
| | | | <u>0.0-2.0' SAMPLE.</u> Recovered 2.0/2.0' = 100%. 0.0-0.5': TOP SOIL: varied greens and browns; grass and ice; subangular; cobbles up to 1" diameter; sandy clay; frozen. | HNu background=1.2. OVA Background=1.6 Ludlum background = 0.0 |
| 5 | | | ARTIFICIAL FILL/DISTURBED | |
| | | | 0.5-1.1': CLAYEY SAND: pale yellowish brown (10 YR 6/2) to dark yellowish brown (10 YR 4/2); very coarse-grained (2.0-1.5 Ø to 1/4"), poorly sorted sand; subrounded to angular; small quartzite gravel up to 1" diameter; unconsolidated; moist to frozen. | 0.0-2.0': Field screen readings: HNu = 1.2 (1.2); OVA = 1.9 (1.2). |
| 10 | | | 1.1-2.0': SANDY CLAY: moderate brown (5 YR 3/4); some very coarse-grained, poorly sorted, subrounded to angular sand; angular quartzite gravel up to 3" diameter; varied green to yellow red orange to red staining throughout core; damp. | 0.0-2.0': Field screen sample: SP168702FS. 2.0-3.5': Field screen readings: HNu = 1.2 (1.2); OVA = 1.2 (1.2). |
| 15 | | | | 4.0-6.0': Field screen readings: HNu = 1.6 (1.6); OVA = 1.2 (1.2). |
| | | | | 6.0-8.0': Field screen readings: HNu = 1.2 (1.2); OVA = 1.0 (1.0). |
| | | | | 6.0-8.0': Upper contact sample: SP168708UC. |
| | | | | 10.0-11.2': Contact sample: SP168710CT |
| 20 | | | | 11.2-13.4': Field screen readings: HNu = 1.2 (1.2); OVA = 1.0 (1.0). |

LOG OF BOREHOLE

Location Rocky Flats Plant; Solar Pond Area
Coordinates N 37654.23 E 21319.10
Total Depth 13.40'

Drilling Company Boyles Bros.
Date Drilled January 7, 1988
Drilling Method Hollow Stem Auger
Logged By KD Holliway
Geologist

Borehole/Well No. 56-87/SP16-87 (cont'd.)

Ground Surface Elevation 5978.51'

Water Level Encountered None

Static _____

Driller T. High

Helper B. Keenev

Drilling Fluid None

Checked By _____

Site Manager

CEARP Manager

Comments _____

| Depth Feet | Graphic Log | Sample Type | Lithologic Description | Samples Collected or Other Tests Performed |
|---------------|----------------|----------------|--|--|
| | | | <p><u>2.0-4.0' SAMPLE.</u> Recovered 1.5/2.0' = 75%. CLAYEY SAND AND GRAVEL: light brown (5 YR 5/6) with pale yellowish orange (10 YR 8/6) and dark yellowish orange (10 YR 6/6) with trace moderate reddish brown (10 YR 4/6), mostly in sand zones; very coarse-grained, poorly sorted sand, subangular to angular; quartzite gravel subangular to broken, to 3" diameter; becomes sandier down core with medium-grained (2.5-1.5 Ø) fairly sorted, subangular sand; damp.</p> <p><u>4.0-6.0' SAMPLE.</u> Recovered 2.0/2.0' = 100%. SANDY CLAY: moderate yellowish brown (10 YR 5/4) to dark yellowish brown (10 YR 4/2) with some yellowish gray (5 Y 7/2) especially towards bottom of core; subangular to angular quartzite gravel up to 2" diameter increases down core; quartzitic sand and pebbles, sub-rounded to subangular medium-grained (2.0-1.5 Ø) to coarse-grained up to 1/4" diameter; poorly sorted; unconsolidated; some caliche increases down core; damp to moist.</p> | <p><u>11.2-13.4': Bedrock</u> Sample: SP168711BR</p> |

OF BOREHOLE

Location Rocky Flats Plant; Solar Pond Area
 Coordinates N 37654.23 E 21319.10
 Total Depth 13.40'

Borehole/Well No. 56-87/SP16-87 (cont'd.)
 Ground Surface Elevation 5978.51'
 Water Level Encountered None

Drilling Company Boyles Bros.
 Date Drilled January 7, 1988
 Drilling Method Hollow Stem Auger
 Logged By KD Holliday
 Geologist

Static _____
 Driller T. High
 Helper B. Keeney
 Drilling Fluid None
 Checked By _____
 Site Manager
 GEARP Manager

Comments _____

| Depth Feet | Graphic Log | Sample Type | Lithologic Description | Samples Collected or Other Tests Performed |
|---------------|----------------|----------------|---|---|
| | | | <u>6.0-8.0' SAMPLE.</u> Recovered 2.0/2.0' = 100%. 6.0-6.3': GRAVEL: angular to broken; some fine-grained sand; dry. 6.3-7.0': CLAYEY SAND: dusky yellow (5 Y 6/4) to yellowish gray (5 Y 7/2); some clay; sand is very fine-grained to fine-grained (2.5-2.0 Ø); fairly well sorted; unconsolidated; some caliche (strong reaction to HCl); damp to moist. 7.00-8.00': CLAYEY SAND AND GRAVEL: yellowish gray (5 Y 7/2) with light brown (5 YR 5/6) and moderate reddish brown (10 R 4/6) staining; fine-grained (2.5-2.0 Ø) to coarse-grained, poorly sorted, subrounded to subangular sand; subangular gravel; lots of caliche; unconsolidated; moist. | |
| | | | <u>8.0-10.0' SAMPLE.</u> Recovered 0.0/2.0' = 0%. Lost core. | |
| | | | <u>ARAPAHOE FORMATION</u> | |
| | | | Q/Ka contact estimated at 9.40' by drilling and cuttings. | |
| | | | <u>10.0-11.2' SAMPLE.</u> Recovered 1.8/1.2' = 150%. SANDY CLAYSTONE: light olive gray (5 Y 5/2) to yellowish gray (5 Y 7/2) with dark yellowish orange (10 YR 6/6) iron staining; very fine-grained to fine-grained sand; some caliche; consolidated; damp. | |

LOG OF BOREHOLE

Location Rocky Flats Plant; Solar Pond Area

Coordinates N 37654.23 E 21319.10

Total Depth 13.40'

Drilling Company Boyles Bros.

Date Drilled January 7, 1988

Drilling Method Hollow Stem Auger

Logged By KD Holliday
Geologist

Borehole/Well No. 56-87/SP16-87 (cont'd.)

Ground Surface Elevation 5978.51'

Water Level Encountered None

Static _____

Driller T. High

Helper B. Keenev

Drilling Fluid None

Checked By _____

Site Manager

CEARP Manager

Comments _____

| Depth Feet | Graphic Log | Sample Type | Lithologic Description | Samples Collected or Other Tests Performed |
|---------------|----------------|----------------|--|---|
| | | | <u>11.2-13.4' SAMPLE.</u> Recovered 2.2/2.2' = 100%. SANDY CLAYSTONE: same as above with occasional iron nodules. TOTAL DEPTH: 13.40'. | |

WELL COMPLETION INFORMATION

Location Rocky Flats Plant; Solar Ponds Area

Well No. 56-87/SP16-87

Coordinates N 37654.23 E 21319.10

Elevation: Ground Surface 5978.51'

Total Depth: Well 9.92'

Top of Casing 5979.89'

Borehole 13.40'

Formation of Completion Rocky Flats Alluvium

Casing Material Sch 5, Type 316, TFJ Stainless Steel

Casing Diameter 2" ID

Screen Material 0.010" wire wrap, Type 316, TFJ Stainless Steel

Surface Casing Diameter 5" ID

Date Installed January 8, 1987

Approved By _____

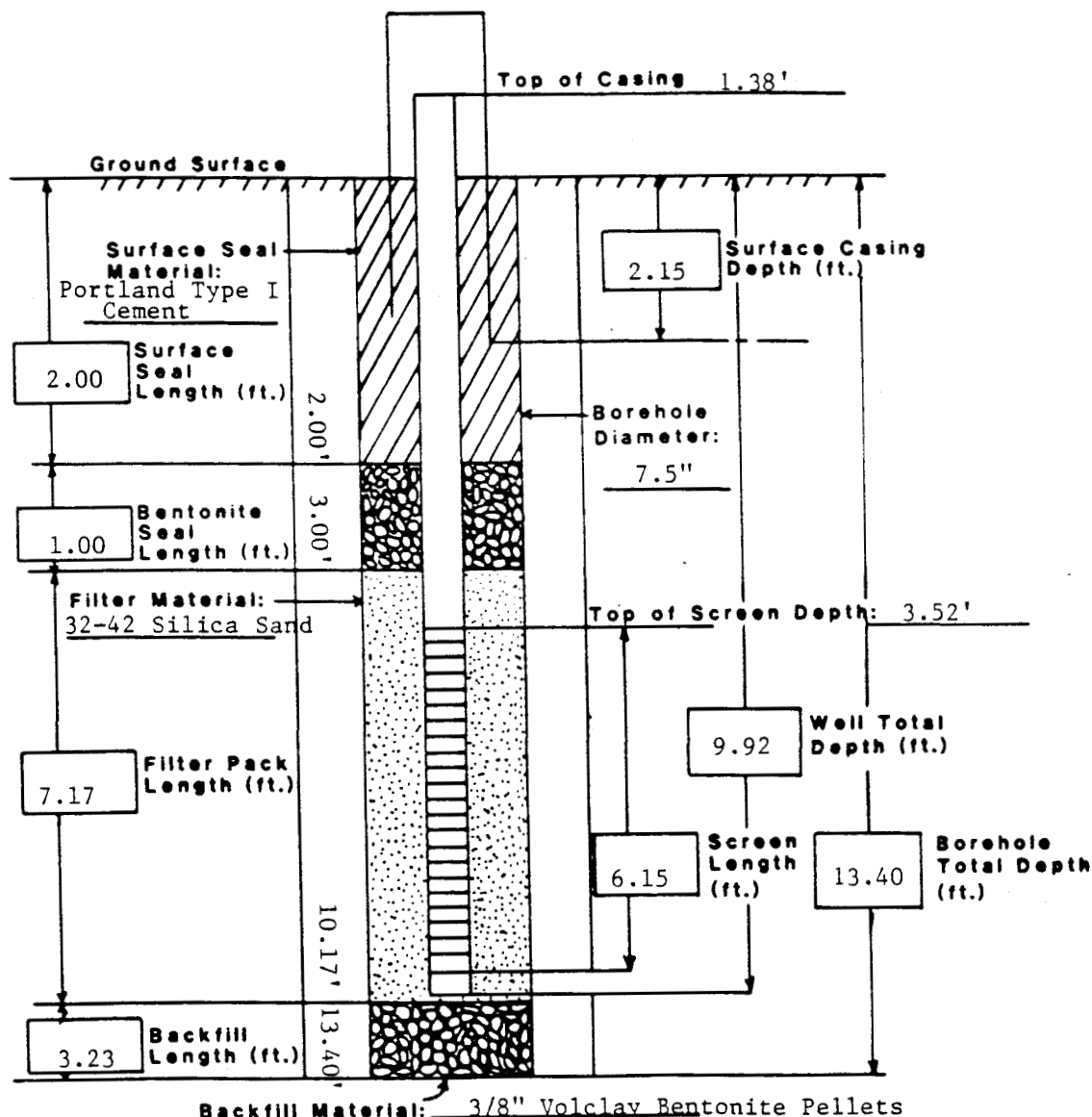
Installed By K.D. Holliway

Site Manager

Geologist

CEARP Manager

Comments _____



Well No.: 56-87

WELL DEVELOPMENT SUMMARY SHEET

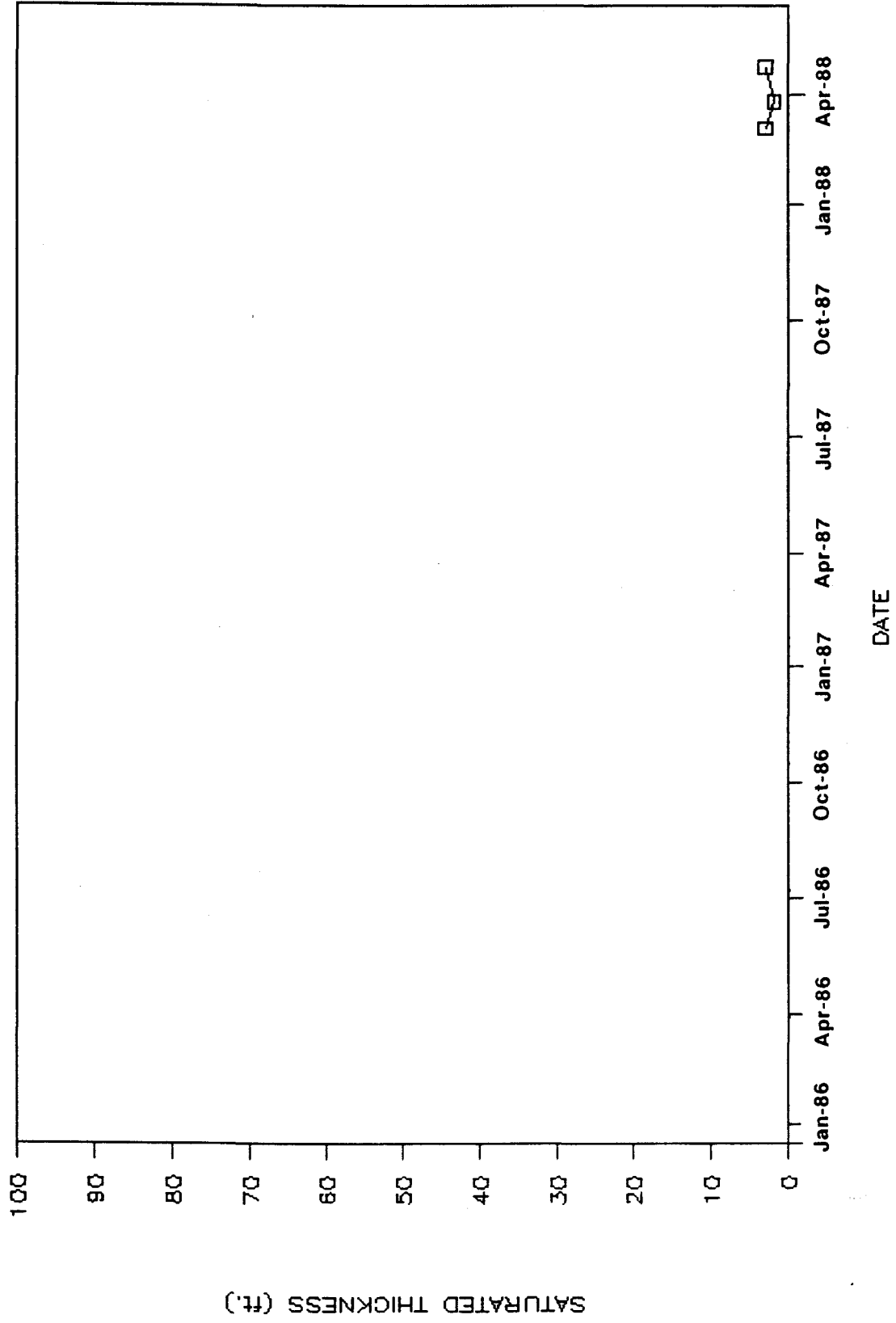
[illegible]

ROCKY FLATS SOLAR PONDS

WATER LEVEL SUMMARY

| <u>WELL</u> <u>NUMBER</u> | <u>DATE</u> | <u>GROUND</u> <u>SURFACE</u> <u>ELEVATION</u> | <u>TOP OF</u> <u>CASING</u> <u>ELEVATION</u> | <u>STICK</u> <u>UP</u> | <u>DEPTH</u> <u>OF SI</u> <u>BASE</u> | <u>WATER</u> <u>DEPTH</u> <u>BELOW TOC</u> | <u>WATER</u> <u>SURFACE</u> <u>ELEVATION</u> |
|------------------------------|-------------|---|--|---------------------------|---|--|--|
| 5687 | 02/29/88 | 5978.51 | 5979.89 | 1.38 | 9.67 | 6.70 | 5973.19 |
| | 03/21/88 | | | | | 7.80 | 5972.09 |
| | 04/18/88 | | | | | 6.70 | 5973.19 |

SATURATED THICKNESS IN WELL # 56-87 (SP)



APPENDIX B-3
1987 BOREHOLES

INDEX OF DATA

Boring No.: SP01-87

Completed as well? NO

Data in File

- ☒ Log of Borehole
- ☐ Well Construction Summaries
- ☐ Well Development Summaries
- ☐ Hydraulic Conductivity Test Data and Results
- ☐ Packer Test Data and Results
- ☐ Water Level Data
- ☐ Saturated Thickness Hydrographs

LOG OF BOREHOLE

Location Rocky Flats Plant; Solar Ponds Area
Coordinates * N 37792 E 21209
Total Depth 30.2'

Borehole/Well No. SP01-87
Ground Surface Elevation *5982.7'
Water Level Encountered 15.2'

Static _____

Drilling Company Boyles Bros.
Date Drilled October 27-28, 1987
Drilling Method Hollow Stem Auger
Logged By J. Bacchus
Geologist

Driller R. Sharp
Helper T. Merritt
Drilling Fluid None
Checked By _____

Site Manager

CEARP Manager

Comments Borehole backfilled with Portland Type I Cement.
*Coordinates and elevation estimated from topographic map.

| Depth Feet | Graphic Log | Sample Type | Lithologic Description | Samples Collected or Other Tests Performed |
|---------------|----------------|----------------|--|--|
| 0 | | | <u>ARTIFICIAL FILL/DISTURBED</u> | |
| | | | 0.0-2.0' SAMPLE. Recovered 1.2/2.0' = 60%. 0-0.6': SAND: moderate yellowish brown (10 YR 5/4); silt and clay, asphalt; slight HCl reaction. 0.6-1.2': CLAY: moderate yellowish brown (10 YR 5/4); dense; large pebbles; caliche; dry. | HNu Background=0.8 OVA Background=1.0 Ludlum Background=0.0 |
| | | | 2.0-4.0' SAMPLE. Recovered 2.0/2.0' = 100%. CLAY: dense; large angular clasts of igneous origin; reacts with HCl; slightly moist. | No Ludlum readings above background |
| 5 | | | 4.0-5.0' SAMPLE. Recovered 1.2/1.0' = 120%. 4.0-4.1': CLAY: same as above. 4.1-4.35': layer of asphalt 4.35-5.0': CLAY: same as layer above except one large chunk of redwood; appears to be a stake. | 0.0-1.2': Field Screen Reading: HNu=0.4(0.4); OVA=1.2(0.6). 0.0-1.2': Field Screen Sample: SP018700FS. |
| | | | 5.0-8.0' SAMPLE. Recovered 1.3/3.0' = 43%. 5.0-7.7': CLAY: moderate yellowish brown (10 YR 5/4) with some spots of dark yellowish orange (10 YR 6/6); sandy; silty; pebbly; clasts are subangular to highly angular; dry. 7.7-8.0': CLAY: moderate reddish brown (10 YR 4/6); some coarse sand; slightly moist. | 4.0-5.0': Reading on Core: HNu=1.4; OVA=1.2. 4.0-5.0': Direct Hit Sample: SP018704DH. |
| 10 | | | 8.0-10.5' SAMPLE. Recovered 2.0/2.5' = 80%. 8.0-9.1': CLAY: same as above. 9.1-10.0': SAND: moderate yellowish brown (10 YR 5/4) to dark yellowish orange (10 YR 6/6); no HCl reaction; very poorly sorted; size ranges from clay to pebbles; clasts are very angular; dry. | 5.0-6.3': Reading on Core: HNu=3.4; OVA=1.2. 5.0-6.3': Direct Hit Sample: SP018705DH. |
| | | | 10.5-12.7' SAMPLE. Recovered 1.65/2.5' = 66%. SAND: same as above; contains some subrounded small cobbles; dry. | 8.0-10.0': Readings on Core: HNu=3.4; OVA=1.2. |
| 15 | | | 12.7-15.2' SAMPLE. Recovered 1.2/2.5' = 48%. 12.7-13.2': SAND: moderate reddish brown (10 YR 4/6); conglomeratic sand; poorly sorted; silt; clay and large pebbles angular to subrounded; sand; slight HCl reaction; dry. | 10.5': Readings in Breathing Zone: HNu=0.6; OVA=2.5. 10.5-12.2': Readings on Core: HNu=1.0; OVA=2.8. 10.5-12.2': Direct Hit/Upper Contact Sample: SP 018711DH. |
| 20 | | | | 12.7-13.9': Readings on Core: HNu=1.0; OVA=2.8. |

LOG OF BOREHOLE

Location Rocky Flats Plant; Solar Ponds Area

Coordinates _____

Total Depth _____

Drilling Company _____

Date Drilled _____

Drilling Method _____

Logged By _____

Geologist

Borehole/Well No. SP01-87(cont'd.)

Ground Surface Elevation _____

Water Level Encountered _____

Static _____

Driller _____

Helper _____

Drilling Fluid _____

Checked By _____

Site Manager

CEARP Manager

Comments _____

| Depth Feet | Graphic Log | Sample Type | Lithologic Description | Samples Collected or Other Tests Performed |
|---------------|----------------|----------------|---|--|
| 20 | | | ARAPAHOE FORMATION | |
| | | | 13.2-13.9': SANDSTONE: yellowish gray (5 Y 7/2); clean; mottled oxidation; dark yellowish orange (10 YR 6/6); well sorted, small amount of clay; slightly moist. | 12.7-14.9': Direct Hit/Contact Sample: SP018713DH. |
| | | | 15.2-17.7' SAMPLE. Recovered 1.5/2.5' = 60%. SANDSTONE: moderate yellowish brown (10 YR 5/4) to yellowish gray (5 Y 7/2); claystone soaked except last 0.15 ft where it is wet to moist. | 15.2-16.7': Readings on Core: HNU=2.1; OVA=10.0. |
| 25 | | | 17.7-20.2' SAMPLE. Recovered 2.35/2.5' = 94%. 17.7-17.9': CLAYSTONE: light olive gray (5 Y 5/2); very fissile; no sand; moist. 17.9-18.9': SANDSTONE: alternating bands of yellowish gray (5 Y 7/2) and dark yellowish orange (10 YR 6/6); coarse-grained; subrounded; moist to dry. 18.9-20.05': SANDSTONE: yellowish gray (5 Y 7/2); highly stained with dark yellowish orange (10 YR 6/6); fractures; well consolidated; fine to coarse-grained; no HCl reaction; moist. | 15.2-16.7': Bedrock Sample: SP0187168R. 20.2-22.3': Readings on Core: HNU=2.3; OVA=1.8. 20.2-22.3': Direct Hit Sample: SP018721DH. |
| 30 | | | 20.2-22.7' SAMPLE. Recovered 2.1/2.5' = 84%. SANDSTONE: same as above. | 22.7-24.8': Readings on Core: HNU=0.2; OVA=4.3. |
| | | | 22.7-25.2' SAMPLE. Recovered 2.1/2.5' = 84%. SANDSTONE: dark yellowish orange (10 YR 6/6) and yellowish gray (5 Y 7/2); fine-grained; well consolidated; slightly moist. | 22.7-24.8': Direct Hit Sample: SP018723DH. |
| 35 | | | 25.2-27.7' SAMPLE. Recovered 2.4/2.5' = 96%. 25.2-25.9': CLAYSTONE: dark yellowish orange (10 YR 6/6) and yellowish gray (5 Y 7/2); sand; dry. 25.9-27.6': SANDSTONE: dark yellowish orange (10 YR 6/6) and yellowish gray (5 Y 7/2); coarse-grained; dry. | 25.2-27.6': Readings on Core: HNU = 0.3; OVA = 0.6. |
| | | | 27.7-30.2' SAMPLE. Recovered 2.65/2.5' = 120%. SANDSTONE: same as above except sand is finer-grained. | 27.7-30.2': Readings on Core: HNU = 0.3; OVA = 0.6. |
| 40 | | | TOTAL DEPTH: 30.2'. | |

INDEX OF DATA

Boring No.: SP02-87

Completed as well? No

Data in File

- ☒ Log of Borehole
- ☐ Well Construction Summaries
- ☐ Well Development Summaries
- ☐ Hydraulic Conductivity Test Data and Results
- ☐ Packer Test Data and Results
- ☐ Water Level Data
- ☐ Saturated Thickness Hydrographs

LOG OF BOREHOLE

Location Rocky Flats Plant; Solar Ponds Area

Coordinates * N 37980 E 21532

Total Depth 15.1'

Borehole/Well No. SP02-87

Ground Surface Elevation *5976.6'

Water Level Encountered None

Static

Drilling Company Boyles Bros.

Driller R. Sharp

Date Drilled October 29, 1987

Helper T. Merritt

Drilling Method Hollow Stem Auger

Drilling Fluid None

Logged By J. Bacchus
Geologist

Checked By

Site Manager

CEARP Manager

Comments Borehole backfilled with Portland Type I Cement.

*Coordinates and elevation estimated from topographic map.

| Depth Feet | Graphic Log | Sample Type | Lithologic Description | Samples Collected or Other Tests Performed |
|---------------|----------------|----------------|--|---|
| 0 | | | <u>ARTIFICIAL FILL/DISTURBED</u> | |
| | | | <u>0-2.0' SAMPLE.</u> Recovered 2.0/2.0' = 100%. CLAY: grayish brown (5 YR 3.2); sand, silt and gravel; clasts are angular; no roots; well indurated; dry. | HNu Background=0.9 OVA Background = 0.5-5.0 Ludlum Background = 0.0 |
| | | | <u>2.0-4.0' SAMPLE.</u> Recovered 1.7/2.0' = 81%. CLAY: grayish brown (5 YR 3/2); poorly sorted, with sand silt and gravel; no reaction with HCl; dry. | No readings above background |
| 5 | | | <u>4.0-7.0' SAMPLE.</u> Recovered 1.7/3.0' = 53%. CLAY: same as above. | 0.0-10.1': Composite Sample: SP02870008. (VOAs taken at 7.6-10.1). |
| | | | Total depth measured at 7.6'. Readjust depth. | 7.6-10.1': Upper Contact Sample: SP028708UC. |
| | | | <u>7.6-10.1' SAMPLE.</u> Recovered 2.7/2.5' = 108%. 7.6-7.85': CLAY: same as above. 7.85-9.0': CALICHE: very pale orange (10 YR 8/2), reacts violently with HCl; silt size; dry. 9.0-10.1': CLAY: pale yellowish orange (10 YR 8/6); caliche; reacts violently with HCl; some angular pebbles; sand and silt; dry. | 10.1-12.6': Contact Sample: SP028711CT. |
| 10 | | | <u>ARAPAHOE FORMATION</u> | 12.6-15.1': Bedrock sample: SP028713BR. |
| | | | <u>10.1-12.6' SAMPLE.</u> Recovered 2.6/2.5' = 104%. SANDSTONE: yellowish gray (5 Y 7/2) with bands of light yellowish orange; fine to coarse-grained sand; caliche; coal; turns green with contact with HCl; dry. | |
| 15 | | | <u>12.6-15.1' SAMPLE.</u> Recovered 2.7/2.5' = 108%. SANDSTONE: same as above except mottled with light yellowish orange; the sand is coarser; slightly moist near the bottom. | |
| | | | TOTAL DEPTH: 15.1'. | |
| 20 | | | | |

INDEX OF DATA

Boring No.: SP03-87

Completed as well? No

Data in File

- ☒ Log of Borehole
- ☐ Well Construction Summaries
- ☐ Well Development Summaries
- ☐ Hydraulic Conductivity Test Data and Results
- ☐ Packer Test Data and Results
- ☐ Water Level Data
- ☐ Saturated Thickness Hydrographs

LOG OF BOREHOLE

Location Rocky Flats Plant; Solar Ponds Area
Coordinates * N 37485 E 21532
Total Depth 20.4'

Borehole/Well No. SP03-87
Ground Surface Elevation *5978.7'
Water Level Encountered 12.8'
Static _____

Drilling Company Bovles Bros.
Date Drilled October 21 and 26, 1987
Drilling Method Hollow Stem Auger
Logged By J. Bacchus
Geologist

Driller R. Sharp
Helper T. Merritt
Drilling Fluid None
Checked By _____
Site Manager
CEARP Manager

Comments Borehole backfilled with Portland Type I Cement.
*Coordinates and elevation estimated from topographic map.

| Depth Feet | Graphic Log | Sample Type | Lithologic Description | Samples Collected or Other Tests Performed |
|---------------|----------------|----------------|---|---|
| 0 | | | <u>ARTIFICIAL FILL/DISTURBED</u> | |
| | | | <u>0-2.0' SAMPLE.</u> Recovered 1.75/2.0' = 86%. SOIL: dark yellowish brown (10 YR 4/2); roots in the upper 0.4 ft; sizes range from clay to small cobbles; clasts are very angular and not oriented in any order; very poorly sorted; dry. | HNu Background=0.4 OVA Background = 0.0-2.2 Ludlum Background = 0.0 |
| | | | <u>ROCKY FLATS ALLUVIUM</u> | |
| 5 | | | <u>2.0-4.0' SAMPLE.</u> Recovered 1.5/2.0' = 75%. 2.0-3.1': CLAY: same as above. 3.1-3.5': CLAY: same as above except much more clay; grayish black (N 2/0); moist. | <u>2.0-3.5':</u> Reading on Core: HNu=2.0; OVA=20. <u>2.0-3.5':</u> Direct Hit Sample: SP038702DH. |
| | | | <u>4.0-5.0' SAMPLE.</u> Recovered 0.6/1.0' = 60%. CLAY: same as above except a large quartzite cobble. | <u>4.0':</u> Reading in Augers: HNu=4; OVA=39. <u>4.0-4.6':</u> Field Screen Sample: SP038703FS (VOAs only). |
| 10 | | | <u>5.0-8.0' SAMPLE.</u> Recovered 1.85/3.0' = 62%. 5.0-5.7': CLAY: dusky red (5 R 3/4); some sand, pebbles to 2.5" diameter; clasts range from rounded to angular; moist. 5.7-6.85': SAND: moderate yellowish brown (10 YR 5/4); small cobbles and clay clasts range from rounded to angular; no HCl reaction. | <u>10.3-11.6':</u> Readings on Core: HNu=0.3; OVA=3.6. <u>10.3-11.6':</u> Direct Hit/Upper Contact Sample: SP038711DH. |
| 15 | | | <u>8.0-10.5' SAMPLE.</u> Recovered 1.1/2.5' = 44%. SAND: moderate yellowish brown (10 YR 5/4); mottled with very pale orange (10 YR 8/2); silty sand; large quartzite clasts that are subrounded to angular; high amount of caliche; very poorly sorted, dry. | <u>12.8-14.4':</u> Readings on Core: HNu=0.3; OVA=2.6. |
| 20 | | | <u>10.5-12.8' SAMPLE.</u> Recovered 1.3/2.5' = 52%. SAND: moderate yellowish brown (10 YR 5/4); poorly sorted; quartzite clasts that range in size from small cobbles to large pebbles; some silt; very little clay; no HCl reaction. | |

LOG
OF
BOREHOLE

Location Rocky Flats Plant; Solar Ponds Area

Coordinates _____

Total Depth _____

Borehole/Well No. SP03-87(cont'd.)

Ground Surface Elevation _____

Water Level Encountered _____

Static _____

Drilling Company _____

Driller _____

Date Drilled

Helper _____

Drilling Method _____

Drilling Fluid _____

Logged By


Checked By _____

Geologist

Site Manager

CEARP Manager

Comments

| Depth Feet | Graphic Log | Sample Type | Lithologic Description | Samples Collected or Other Tests Performed |
|---------------|---|----------------|---|---|
| 20 |  | | <p>12.8-15.2' SAMPLE. Recovered 1.6/2.5' = 64%. 12.8-13.2': GRAVEL: moderate yellowish brown (10 YR 5/4); very poorly sorted; clasts are highly angular; clay, silt and sand; saturated; encountered water table at the top of the run.</p> <p style="text-align: center;"><u>ARAPAHOE FORMATION</u></p> <p>13.2-14.4': CLAYSTONE: light olive gray (5 YR 3/2); mottled light brown (5 YR 5/6); dense; pockets of caliche; semi-moist to dry</p> <p>15.2-17.7' SAMPLE. Recovered 1.7/2.5' = 68%. CLAYSTONE: same as above except getting sandy near the bottom of the run.</p> <p>Total depth with plopper 17.9'. Adjust depth.</p> <p>17.9-20.4' SAMPLE. Recovered 1.8/2.5' = 72%. 17.9-18.0': CLAYSTONE: light olive gray (5 Y 5/2); stained light brown (5 YR 5/6); dense; no HCl reaction; moist to wet. 18.0-19.7': SILTSTONE: dark yellowish orange (10 YR 6/6); some coarse-grained sand clasts; pockets of caliche; dry.</p> <p style="text-align: center;">TOTAL DEPTH: 20.4'.</p> | <p>12.8-14.4': Contact Sample: SP038713CT.</p> <p>15.2-16.9': Readings on Core: HNu=0.4; OVA=5.2.</p> <p>15.2-16.9': Bedrock Sample: SP0387168R.</p> <p>17.9-19.7': Readings on Core: HNu=0.3; OVA=2.6.</p> |
| 25 | | | | |
| 30 | | | | |
| 35 | | | | |
| 40 | | | | |

INDEX OF DATA

Boring No.: SP04-87

Completed as well? No

Data in File

- ☒ Log of Borehole
- ☐ Well Construction Summaries
- ☐ Well Development Summaries
- ☐ Hydraulic Conductivity Test Data and Results
- ☐ Packer Test Data and Results
- ☐ Water Level Data
- ☐ Saturated Thickness Hydrographs

LOG OF BOREHOLE

Location Rocky Flats Plant; Solar Ponds Area
Coordinates * N 37561 E 21820
Total Depth 37.0'

Borehole/Well No. SP04-87

Ground Surface Elevation *5971.8'

Water Level Encountered 12.0'

Static

Drilling Company Bovles Bros.

Driller R. Sharp

Date Drilled October 30 and November 3 and 4,
1987

Helper T. Merritt

Drilling Method Hollow Stem Auger

Drilling Fluid None

Logged By J. Bacchus
Geologist

Checked By

Site Manager

CEARP Manager

Comments Borehole backfilled with Portland Type I Cement.

*Coordinates and elevation estimated from topographic map.

| Depth Feet | Graphic Log | Sample Type | Lithologic Description | Samples Collected or Other Tests Performed |
|---------------|----------------|----------------|--|--|
| 0 | | | <u>ARTIFICIAL FILL/DISTURBED</u> | |
| | | | 0.0-2.0' SAMPLE. Recovered 1.2/2.0' = 60%. 0-0.0.3': PEBBLE: large. 0.3-0.9': CLAY: moderate yellowish brown (10 YR 5/4); sand; silt and pebbles; clasts are angular to subrounded; slight reaction to HCl; moist. 0.9-1.2': IGNEOUS ROCK: some fractures. | HNu Background = 0.4-0.5 OVA Background = 0.6-3.6 No Ludlum readings taken |
| 5 | | | 2.0-4.0' SAMPLE. Recovered 1.7/2.0' = 85%. GRAVEL: dusky brown (5 YR 2/2); cobbles to 4 inches in diameter, held together with clay; no HCl reaction; moist. | 2.0-3.7': Readings on Core: HNu = 15; OVA = 0.4. 2.0-3.7': Direct Hit Sample: SP048702DH. |
| | | | 4.0-7.0' SAMPLE. Recovered 1.8/3.0' = 60%. 4.0-4.8': GRAVEL: same as above. 4.8-5.8': CALICHE; very pale orange (10 YR 8/2); silt; small angular cobbles similar to the clasts above; dry. | 4.0-5.8': Reading on Core: HNu=400; OVA=0.2. 4.0-5.8': Direct Hit Sample: SP048704DH. |
| 10 | | | 7.0-9.5' SAMPLE. Recovered 1.7/2.5' = 68%. 7.0-8.3': CALICHE: same as above. 8.3-8.7': GRAVEL: with caliche, similar to caliche above; dry; spotted with moist areas. | 4.0-5.8': Duplicate Sample: SP0487004D. 7.0': Readings in Breathing Zone: HNu=1.2; OVA=1.0. |
| | | | <u>ARAPAHOE FORMATION</u> | 7.0-9.5': Readings on Core: HNu=750; OVA=0.2. |
| | | | 9.5-12.0' SAMPLE. Recovered 0.6/2.5' = 24%. SANDSTONE: yellowish gray (5 Y 7/2; contains small pebbles; grains are rounded to subrounded; coarse-grained; some clay; very moist. | 7.0-8.7': Direct Hit/Upper Contact Sample: SP048707DH. |
| 15 | | | 12.0-14.5' SAMPLE. Recovered 2.9/2.5' = 116%. 12.0-12.2': GRAVEL: moderate yellowish brown (10 YR 5/4); some clay and sand; wet. 12.2-14.5': CLAYSTONE: light olive gray (5 YR 5/2); mottled with dark yellowish orange (10 YR 6/6); moist. | 10.5': Readings in Breathing Zone: HNu=0.6; OVA=2.5. 9.5-11.1': Readings on Core: HNu=20; OVA=7.8. |
| | | | | 9.5-11.1': Direct Hit/Contact Sample: SP048710DH (VOAs only). |
| | | | | 12.0-14.5': Readings on Core: HNu=85; OVA=3.3. |
| 20 | | | | 12.0-14.5': Direct Hit/Water Table/ Bedrock Sample: SP048712DH. |

LOG OF BOREHOLE

Location Rocky Flats Plant; Solar Ponds Area Borehole/Well No. SP04-87(cont'd.)
 Coordinates _____ Ground Surface Elevation _____
 Total Depth _____ Water Level Encountered _____
 Static _____
 Drilling Company _____ Driller _____
 Date Drilled _____ Helper _____
 Drilling Method _____ Drilling Fluid _____
 Logged By _____ Checked By _____
 Geologist _____ Site Manager _____
 CEARP Manager _____

Comments _____

| Depth Feet | Graphic Log | Sample Type | Lithologic Description | Samples Collected or Other Tests Performed |
|---------------|----------------|----------------|---|--|
| 20 | | | <p><u>14.5-17.0' SAMPLE.</u> Recovered 2.7/2.5' = 108%. 14.5-15.1': CLAYSTONE: light olive gray (5 Y 5/2) stained with dark yellowish orange (10 YR 6/6); blocky structure, concretions of caliche; moist. 15.1-17.0': Same as above; wet.</p> <p><u>17.0-19.5' SAMPLE.</u> Recovered 2.6/2.5' = 104%. 17.0-17.2': CLAYSTONE: same as above. 17.2-18.3': CLAYSTONE: dark yellowish orange (10 YR 6/6); slightly moist. 18.3-19.5': CLAYSTONE: olive gray (5 Y 3/2) mottled with dark yellowish orange (10 YR 6/6); very slightly moist.</p> <p><u>19.5-22.0' SAMPLE.</u> Recovered 2.6/2.5' = 104%. CLAYSTONE: same as above.</p> <p><u>22.0-24.5' SAMPLE.</u> Recovered 2.5/2.5' = 100%. CLAYSTONE: same as above except a little more sand.</p> <p><u>24.5-27.0' SAMPLE.</u> Recovered 2.5/2.5' = 100%. 24.5-25.0': CLAYSTONE: same as above except less sand, more consolidated and dry. 25.0-27.0': CLAYSTONE: olive gray (5 Y 2/2); some coal; slightly sandy; dry.</p> <p><u>27.0-29.5' SAMPLE.</u> Recovered 2.5/2.5' = 100%. CLAYSTONE: same as above except layers of oxidation from 0.2 to 0.4 ft in thickness; dark yellowish orange (10 YR 6/6); grades from pure claystone at the top to very sandy claystone at the bottom; pockets of caliche in unweathered areas; dry.</p> <p><u>29.5-32.0' SAMPLE.</u> Recovered 2.7/2.5' = 108%. CLAYSTONE: same as above except much more sandy; dry.</p> | <p><u>14.5-17.0':</u> Readings on Core: HNU=1.0; OVA=2.8.</p> <p><u>14.5-17.0':</u> Field Screen Reading: HNU=650(0.5); OVA=3.6(32).</p> <p><u>14.5-17.0':</u> Field Screen Sample: SP048715FS</p> <p><u>17.0-19.5':</u> Readings on Core: HNU=45; OVA=3.2.</p> <p><u>17.0-19.5':</u> Direct Hit Sample: SP048717DH.</p> <p><u>19.5-22.0':</u> Readings on Core: HNU=60; OVA=3.0.</p> <p><u>19.5-22.0':</u> Direct Hit Sample: SP048720DH.</p> <p><u>22.0-24.5':</u> Readings on Core: HNU = 450; OVA = 30.</p> <p><u>22.0-24.5':</u> Direct Hit Sample: SP048722DH.</p> <p><u>24.5-27.0':</u> Readings on Core: HNU=45; OVA=3.0.</p> <p><u>24.5-27.0':</u> Direct Hit Sample: SP048725DH.</p> <p><u>27.0-29.5':</u> Readings on Core: HNU=4.0; OVA=5.8.</p> <p><u>27.0-29.5':</u> Direct Hit Sample: SP048727DH.</p> <p><u>29.5-32.0':</u> Readings on Core: HNU=0.0; OVA=5.4.</p> <p><u>29.5-32.0':</u> Direct Hit Sample: SP048730DH.</p> |
| 25 | | | | |
| 30 | | | | |
| 35 | | | | |
| 40 | | | | |

LOG
OF
BOREHOLE

Location Rocky Flats Plant; Solar Ponds Area

Coordinates _____

Total Depth _____

Drilling Company _____

Date Drilled _____

Drilling Method _____

Logged By

Geologist

Borehole/Well No. SP04-87 (cont'd)

Ground Surface Elevation _____

Water Level Encountered _____

Static

Driller _____

Helper _____

Drilling Fluid _____

Checked By _____

Site Manager

CEARP Manager

Comments

| Depth Feet | Graphic Log | Sample Type | Lithologic Description | Samples Collected or Other Tests Performed |
|---------------|----------------|----------------|---|--|
| | | | <p><u>32.0-34.5' SAMPLE.</u> Recovered 2.7/2.5' = 108%. CLAYSTONE: dark yellowish orange (10 YR 6/6) mottled with grayish orange pink (5 YR 7/2); very thin seams of coal; no HCl reaction; weathered; slightly moist.</p> <p><u>34.5-37.0' SAMPLE.</u> Recovered 2.5/2.5' = 100%. CLAYSTONE: olive gray (5 Y 3/2) mottled with dark yellowish orange (10 YR 6/6); sandy; contains some coal; dry.</p> <p>TOTAL DEPTH: 37.0'.</p> | <p><u>32.0-34.5'</u>: Readings on Core: HNu=0.2; OVA=1.8.</p> <p><u>32.0-34.5'</u>: Direct Hit Sample: SP048732DH.</p> <p><u>34.5-37.0'</u>: Readings on Core: HNu=0.0; OVA=0.5.</p> <p><u>34.5-37.0'</u>: Field Screen Readings HNu=0(0.0); OVA=0.8(0.8).</p> |

INDEX OF DATA

Boring No.: SP05-87

Completed as well? No

Data in File

- ☒ Log of Borehole
- ☐ Well Construction Summaries
- ☐ Well Development Summaries
- ☐ Hydraulic Conductivity Test Data and Results
- ☐ Packer Test Data and Results
- ☐ Water Level Data
- ☐ Saturated Thickness Hydrographs

LOG OF BOREHOLE

Location Rocky Flats Plant; Solar Ponds Area

Coordinates * N 37865 E 21810

Total Depth 21.8'

Borehole/Well No. SP05-87

Ground Surface Elevation *5971.6'

Water Level Encountered 15.3'

Static

Drilling Company Boyles Bros.

Date Drilled November 5 and 6, 1987

Drilling Method Hollow Stem Auger

Logged By J. Bacchus

Geologist

Driller R. Sharp

Helper T. Merritt; S. Bradfield

Drilling Fluid None

Checked By

Site Manager

CEARP Manager

Comments Borehole backfilled with Portland Type I Cement.

*Coordinates and elevation estimated from topographic map.

| Depth Feet | Graphic Log | Sample Type | Lithologic Description | Samples Collected or Other Tests Performed |
|---------------|----------------|----------------|---|---|
| 0 | | | <u>TOPSOIL</u> | |
| | | | 0.0-2.0' <u>SAMPLE.</u> Recovered 0.4/2.0' = 20%. SOIL: moderate yellowish brown (10 YR 5/4); roots; sand; clay; silt; dry. | HNu Background=1.2 OVA Background=0.8 No Ludlum readings taken |
| | | | <u>ARTIFICIAL FILL/DISTURBED</u> | |
| | | | 2.0-4.0' <u>SAMPLE.</u> Recovered 1.3/2.0' = 65%. GRAVEL: dusky yellowish brown (10 YR 2/2) small cobbles; pebbles; sand, silt, and clay; angular particles; wet to moist. | 0.0-0.4': Readings on Core: HNu = 1.0; OVA = 1.2. |
| 5 | | | 4.0-7.0' <u>SAMPLE.</u> Recovered 1.6/3.0' = 53%. 4.0-4.7': GRAVEL: same as above. 4.7-7.0': CLAY: dark reddish brown (10 R 3/4); some sand and small angular cobbles; dense; dry. | 0.0-0.4': Direct Hit Sample: SP058700DH (VOAs and Rads only). 2.0-3.3': Reading on Core: HNu=0.8; OVA=11. |
| | | | 7.0-9.5' <u>SAMPLE.</u> Recovered 1.3/2.5' = 52%. SAND: very pale orange (10 YR 8/2) and dark yellowish orange (10 YR 6/6); sand, silt, and cobbles; high amount of caliche; poorly sorted; dry. | 2.0-3.3': Direct Hit Sample: SP058702DH. 4.0-5.6': Readings on Core: HNu=0.8; OVA=4.8. |
| 10 | | | 9.5-12.0' <u>SAMPLE.</u> Recovered 1.1/2.5' = 44%. SAND: same as above except slightly moist near the bottom. | 4.0-5.6': Direct Hit Sample: SP058704DH. 7.0-8.3': Readings on Core: HNu=9; OVA=7.8. |
| | | | Total depth of borehole measured 12.8'; adjust depth. | 7.0-8.3': Direct Hit Sample: SP058707DH. |
| | | | 12.8-15.3' <u>SAMPLE.</u> Recovered 1.6/2.5' = 64%. SAND: light olive gray (5 Y 5/2); small cobbles; pebbles; silt; clay clasts are angular; slight HCl reaction; wet on top 0.3 ft; moist in the rest of the run. | 9.5-10.6': Readings on Core: HNu=3.0; OVA=4.8. |
| 15 | | | 15.3-17.3' <u>SAMPLE.</u> Recovered 2.0/2.0' = 100%. 15.3-16.3': GRAVEL: same as above except less sand; strong HCl reaction; very wet. | 9.5-10.6': Direct Hit Sample: SP058710DH. 12.8-14.4': Readings on Core: HNu=2.2; OVA=2.8. |
| | | | | 12.8-14.4': Direct Hit Sample: SP058712DH. |
| | | | | 15.3-17.3': Readings on Core: HNu=1.0; OVA=2.8. |
| | | | | 15.3-17.3': Direct Hit Sample: SP058716DH. |
| 20 | | | | |

LOG
OF
BOREHOLE

Location Rocky Flats Plant; Solar Ponds Area

Coordinates _____

Total Depth _____

Drilling Company _____

Date Drilled _____

Drilling Method _____

Logged By

Geologist

Borehole/Well No. SP05-87(cont'd.)

Ground Surface Elevation _____

Water Level Encountered _____

Static _____

Driller _____

Helper _____


Drilling Fluid _____

Checked By _____

Site Manager

CEARP Manager

Comments _____

| Depth Feet | Graphic Log | Sample Type | Lithologic Description | Samples Collected or Other Tests Performed |
|---------------|---|----------------|---|---|
| 20 |  | | <p><u>ARAPAHOE FORMATION</u></p> <p><u>17.8-19.8' SAMPLE.</u> Recovered 2.2/2.0' = 110%. CLAYSTONE: dusky yellow (5 Y 6/4) to light olive gray (5 Y 5/2) mottled with dark yellowish orange (10 YR 6/6); blocky structure; no HCl reaction; moist to wet.</p> <p><u>19.8-21.8' SAMPLE.</u> Recovered 2.2/2.0' = 110%. CLAYSTONE: Same as above except small pockets of caliche; moist.</p> <p>TOTAL DEPTH: 21.8'.</p> | <p><u>17.8-19.8':</u> Field Screen Readings: HNU=0.0(0.0); OVA=0.4(0.4).</p> <p><u>19.8-21.8':</u> Field Screen Readings: HNU=0.0(0.0); OVA=0.4(0.4).</p> |
| 25 | | | | |
| 30 | | | | |
| 35 | | | | |
| 40 | | | | |

INDEX OF DATA

Boring No.: SP06-87

Completed as well? No

Data in File

- ☒ Log of Borehole
- ☐ Well Construction Summaries
- ☐ Well Development Summaries
- ☐ Hydraulic Conductivity Test Data and Results
- ☐ Packer Test Data and Results
- ☐ Water Level Data
- ☐ Saturated Thickness Hydrographs

LOG OF BOREHOLE

Location Rocky Flats Plant; Solar Ponds Area
Coordinates * N 37900 E 22100
Total Depth 30.7'

Borehole/Well No. SP06-87
Ground Surface Elevation *5972.9'
Water Level Encountered None
Static _____

Drilling Company Boyles Bros.
Date Drilled November 18 and 19, 1987
Drilling Method Hollow Stem Auger
Logged By J. Bacchus
Geologist

Driller R. Sharp
Helper T. Merritt
Drilling Fluid None
Checked By _____

Site Manager

CEARP Manager

Comments Borehole backfilled with Portland Type I Cement.
*Coordinates and elevation estimated from topographic map.

| Depth Feet | Graphic Log | Sample Type | Lithologic Description | Samples Collected or Other Tests Performed |
|---------------|----------------|----------------|---|---|
| 0 | | | <u>ARTIFICIAL FILL/DISTURBED</u> | HNu Background=0.7 OVA Background=0.8 Ludlum Background=0.0 |
| | | | <u>0.0-2.0' SAMPLE.</u> Recovered 0.7/2.0' = 35%. 0.0-0.4': SOIL: dark yellowish brown (10 YR 4/2); sandy; grass and roots; wet to moist. 0.4-0.7': CLAY: moderate yellowish brown (10 YR 5/4) mottled with very pale orange (10 YR 8/2); caliche; sand; small angular cobbles; moist. | <u>0.0-0.7':</u> Readings on Core: HNu = 0.2; OVA = 0.7. <u>0.0-0.7':</u> Field Screen Readings: HNu=0.4(0.3); OVA=0.6(0.6). |
| 5 | | | <u>2.0-4.0' SAMPLE.</u> Recovered 1.7/2.0' = 85%. CLAY: same as above, except slightly larger clasts; moist. | <u>2.0-3.7':</u> Readings on Core: HNu=0.6; OVA=0.7. |
| | | | <u>4.0-5.0' SAMPLE.</u> Recovered 0.0/1.0' = 0%. QUARTZITE: angular block. | <u>2.0-3.7':</u> Field Screen Readings: HNu=400(45); OVA=0.8(0.6). |
| | | | <u>5.0-8.0' SAMPLE.</u> Recovered 1.5/3.0' = 50%. CLAYEY SAND: dark yellowish orange (10 YR 6/6); large angular pebbles; slight HCl reaction; dry. | <u>2.0-3.7':</u> Field Screen Sample: SP068702FS. |
| 10 | | | <u>8.0-10.5' SAMPLE.</u> Recovered 2.4/2.5' = 96%. 8.0-10.0': SOIL: dusky brown (5 YR 2/2); roots; clay, sand, silt, and small angular cobbles; dry. 10.0-10.4': SAND: pale yellowish brown (10 YR 6/2); contains clay and silt; small angular cobbles; no HCl reaction; dry. | <u>5.0-6.5':</u> Readings on Core: HNu=0.4; OVA=0.8. <u>5.0-6.5':</u> Field Screen Readings: HNu=0.4(0.4); OVA=0.0(0.0). |
| | | | <u>10.5-13.0' SAMPLE.</u> Recovered 1.9/2.5' = 76%. CALICHE: very pale orange (10 YR 8/2); sand, silt, clay, small cobbles and pebbles; clasts are angular; dry to slightly moist. | <u>8.0-10.4':</u> Readings on Core: HNu=0.0; OVA=1.7. <u>8.0-10.4':</u> Direct Hit Sample: SP068708DH. |
| 15 | | | <u>13.0-15.5' SAMPLE.</u> Recovered 1.3/2.5' = 52%. CALICHE: same as above except the sample is coarser at the bottom. | <u>10.5-12.4':</u> Readings on Core: HNu=5.0; OVA=1.9; Ludlum=1. <u>10.5-12.4':</u> Direct Hit Sample: SP068711DH. |
| | | | <u>15.5-18.0' SAMPLE.</u> Recovered 1.2/2.5' = 48%. CALICHE: same as above but not as coarse; more small angular cobbles; slightly moist. | <u>13.0-14.3':</u> Readings on Core: HNu=1.2; OVA=20.0; Ludlum=1. <u>13.0-14.3':</u> Direct Hit Sample: SP068713DH. |
| 20 | | | | |

LOG OF BOREHOLE

Location Rocky Flats Plant: Solar Ponds Area

Coordinates _____

Total Depth _____

Drilling Company _____

Date Drilled _____

Drilling Method _____

Logged By _____

Geologist

Borehole/Well No. SP06-87(cont'd.)

Ground Surface Elevation _____

Water Level Encountered _____

Static _____

Driller _____

Helper _____

Drilling Fluid _____

Checked By _____

Site Manager

CEARP Manager

Comments _____

| Depth Feet | Graphic Log | Sample Type | Lithologic Description | Samples Collected or Other Tests Performed |
|---------------|----------------|----------------|--|---|
| 20 | | | <u>ARAPAHOE FORMATION</u> | |
| | | | <u>18.0-20.5' SAMPLE.</u> Recovered 5.0/2.5' = 200%. CLAYSTONE: light olive gray (5 Y 5/2) mottled with dark yellowish orange (10 YR 6/6); some sand near the bottom of the run; pockets of caliche; moist. | <u>15.5-17.7'</u> : Readings on Core: HNU=1.0; OVA=3.0. <u>15.5-17.7'</u> : Direct Hit Sample: SP068716DH. |
| | | | <u>20.5-23.0' SAMPLE.</u> Recovered 3.3/2.5' = 132%. 20.5-21.0': SANDSTONE: dark yellowish orange (10 Y 6/6) mottled with very pale orange (10 YR 8/2); grains are well rounded; high amount of caliche; well rounded pebbles; dry. 21.0-23.0': CLAYSTONE: light olive gray (5 Y 6/2) mottled with dark yellowish orange (10 YR 6/6); pockets of sand; no caliche; slightly moist to dry. | <u>18.0-20.5'</u> : Readings on Core: HNU=0.0; OVA=2.3. <u>18.0-20.5'</u> : Direct Hit Sample: SP068718DH. |
| 25 | | | Total depth of borehole measured 23.2'; adjust depth. | <u>20.5-23.0'</u> : Readings on Core: HNU=0.0; OVA=2.0. <u>20.5-23.0'</u> : Direct Hit Sample: SP068721DH. |
| | | | <u>23.2-25.7' SAMPLE.</u> Recovered 2.5/2.5' = 100%. CLAYSTONE: same as above. | <u>23.2-25.7'</u> : Readings on core: HNU = 2.2; OVA = 7.4. <u>23.2-25.7'</u> : Direct hit sample: SP068724DH. |
| 30 | | | <u>25.7-28.2' SAMPLE.</u> Recovered 2.8/2.5' = 112%. CLAYSTONE: olive gray (5 Y 3/2); slightly weathered; contains sand near the top of the run; dry. | <u>25.7-28.2'</u> : Readings on core: HNU = 1.0; OVA = 6.4. <u>25.7-28.2'</u> : Direct hit sample: SP068726DH. |
| | | | <u>28.2-30.7' SAMPLE.</u> Recovered 3.0/2.5' = 120%. CLAYSTONE: olive gray (5 Y 3/2); mottled with light brown (5 YR 5/6); slightly sandy; blocky structure; dry. | <u>28.2-30.7'</u> : Readings on core: HNU = 1.0; OVA = 1.8; Ludlum = 5. |
| 35 | | | TOTAL DEPTH: 30.7' | <u>28.2-30.7'</u> : Field screen readings: HNU = 1.0(1.0); OVA = 1.4(1.4). |
| 40 | | | | |

INDEX OF DATA

Boring No.: SP07-87

Completed as well? No

Data in File

- ☒ Log of Borehole
- ☐ Well Construction Summaries
- ☐ Well Development Summaries
- ☐ Hydraulic Conductivity Test Data and Results
- ☐ Packer Test Data and Results
- ☐ Water Level Data
- ☐ Saturated Thickness Hydrographs

LOG OF BOREHOLE

Location Rocky Flats Plant; Solar Ponds Area
Coordinates * N 37485 E 22100
Total Depth 31.0'

Borehole/Well No. SP07-87
Ground Surface Elevation *5973.6'
Water Level Encountered 18.0'

Drilling Company Bovles Bros.
Date Drilled November 12 and 13, 1987
Drilling Method Hollow Stem Auger
Logged By J. Bacchus
Geologist

Static _____
Driller R. Sharp
Helper T. Merritt
Drilling Fluid None
Checked By _____

Site Manager

CEARP Manager

Comments Borehole backfilled with Portland Type I Cement.
*Coordinates and elevation estimated from topographic map.

| Depth Feet | Graphic Log | Sample Type | Lithologic Description | Samples Collected or Other Tests Performed |
|---------------|----------------|----------------|--|--|
| 0 | | | <u>ARTIFICIAL FILL/DISTURBED</u> | HNu Background = 0.0-0.8. OVA Background = 0.0-0.6. Ludlum Background = 0.0. |
| | | | <u>0.0-2.0' SAMPLE.</u> Recovered 1.8/2.0' = 90%. CLAY: moderate yellowish brown (10 YR 5/4); small angular cobbles; pebbles; sand and silt; green grass and roots; caliche; moist. | <u>0.0-1.8':</u> Readings on core: HNu = 0.1; OVA = 6.0. |
| | | | <u>2.0-4.0' SAMPLE.</u> Recovered 1.8/2.0' = 90%. 2.0-2.2': CLAY: same as above. | <u>0.0-1.8':</u> Direct hit sample: SP078700DH. |
| 5 | | | <u>ROCKY FLATS ALLUVIUM</u> | <u>2.0-3.8':</u> Readings on core: HNu = 4.0; OVA = 11. |
| | | | 2.2-2.5': GRAVEL: dark reddish brown (10 R 3/4); clasts are very angular quartzite; clay in between clasts; very sticky; moist. | <u>2.0-3.8':</u> Direct hit sample: SP078702DH. |
| | | | 2.5-3.8': CLAY: moderate brown (5 YR 4/4); pebbles; sand and silt; dry. | <u>4.0-5.0':</u> Readings on core: HNu = 0.8; OVA = 0.0. |
| | | | <u>4.0-5.0' SAMPLE.</u> Recovered 1.2/1.0' = 120%. CLAY: same as above except much larger clasts; dry. | <u>4.0-5.0':</u> Field screen readings: HNu = 0.5(0.5); OVA = 0.6(0.5). |
| 10 | | | <u>5.0-8.0' SAMPLE.</u> Recovered 1.3/3.0' = 43%. 5.0-5.8': CLAY: Same as above. | <u>5.0-6.3':</u> Readings on core: HNu = 0.6; OVA = 0.0. |
| | | | 5.8-6.3': CLAY: dusky yellowish brown (10 YR 2/2) at the top grading to dark yellowish orange (10 YR 6/6) at the bottom; gravel, sand and silt; pockets of caliche; slightly moist to dry. | <u>5.0-6.3':</u> Field screen readings: HNu = 0.5(0.5); OVA = 0.4(0.4). |
| | | | <u>8.0-10.5' SAMPLE.</u> Recovered 2.3/2.5' = 92%. 8.0-8.5': CLAY: same as above. | <u>8.0-10.3':</u> Readings on core: HNu = 0.5; OVA = 0.8. |
| 15 | | | 8.5-10.3': CLAY: dusky brown (5 YR 2/2); roots; caliche; cobbles; sand; pebbles; silt; moist. | <u>8.0-10.3':</u> Field screen readings: HNu = 0.3(2.2); OVA = 6.8(3.2). |
| | | | <u>10.5-13.0' SAMPLE.</u> Recovered 1.7/2.5' = 68%. 10.5-11.3': CLAY: same as above except slightly more wet. | <u>8.0-10.3':</u> Field screen sample: SP078708FS. |
| | | | 11.3-12.2': SILT: pale yellowish brown (10 YR 6/2); clasts of angular pebbles and coarse-grained sand; no HCl reaction; dry. | <u>10.5-12.2':</u> Readings on core: HNu = 1.0; OVA = 24. |
| 20 | | | | <u>10.5-12.2':</u> Direct hit sample: SP078711DH. |

LOG OF BOREHOLE

Location Rocky Flats Plant; Solar Ponds Area

Coordinates _____

Total Depth _____

Drilling Company _____

Date Drilled _____

Drilling Method _____

Logged By _____

Geologist

Borehole/Well No. SP07-87(cont'd.)

Ground Surface Elevation _____

Water Level Encountered _____

Static _____

Driller _____

Helper _____

Drilling Fluid _____

Checked By _____

Site Manager

CEARP Manager

Comments _____

| Depth Feet | Graphic Log | Sample Type | Lithologic Description | Samples Collected or Other Tests Performed |
|---------------|----------------|----------------|---|--|
| 20 | | | <p><u>13.0-15.5' SAMPLE.</u> Recovered 1.8/2.5' = 72%. 13.0-13.8': SILT: same as above. 13.8-14.8': CLAY: mottled dark greenish yellow (10 Y 6/6) and grayish olive (10 Y 4/2); sand; silt; pebbles and small cobbles; moist.</p> <p><u>15.5-18.0' SAMPLE.</u> Recovered 1.2/2.5' = 48%. SAND: grayish orange (10 YR 7/4); coarse; clay; large angular pebbles; high amount of caliche; moist.</p> <p><u>18.0-20.5' SAMPLE.</u> Recovered 1.3/2.5' = 52%. SAND: Same as above but more coarse; wet.</p> <p><u>20.5-23.0' SAMPLE.</u> Recovered 3.8/2.5' = 155%. 20.5-21.3': SAND: same as above.</p> <p>ARAPAHOE FORMATION</p> <p>21.3-23.0': CLAYSTONE: light olive gray (5 Y 5/2) mottled with pale yellowish orange (10 YR 8/6); dense; moist.</p> <p><u>23.0-26.0' SAMPLE.</u> Recovered 5.0/3.0' = 167%. CLAYSTONE: same as above.</p> <p><u>26.0-28.5' SAMPLE.</u> Recovered 3.0/2.5' = 120%. 26.0-27.2': CLAYSTONE: same as above. 27.2-28.5': CLAYSTONE: olive gray (5 Y 3/2); mottled with light brown (5 YR 5/6); dense; dry.</p> <p><u>28.5-31.0' SAMPLE.</u> Recovered 3.3/2.5' = 132%. CLAYSTONE: same as above.</p> <p>TOTAL DEPTH: 31.0'</p> | <p><u>13.0-14.8':</u> Readings on core: HNu = 0.4; OVA = 30.</p> <p><u>13.0-14.8':</u> Direct hit sample: SP078713DH.</p> <p><u>15.5-16.7':</u> Readings on core: HNu = 1.0; OVA = 11.</p> <p><u>15.5-16.7':</u> Direct hit sample: SP078716DH.</p> <p><u>18.0-19.3':</u> Readings on core: HNu = 0.6; OVA = 11.</p> <p><u>18.0-19.3':</u> Water table sample: SP078718WT.</p> <p><u>20.5-23.0':</u> Readings on core: HNu = 1020; OVA = 2.0.</p> <p><u>20.5-23.0':</u> Contact sample: SP078721CT.</p> <p><u>23.0-26.0':</u> Readings on core: HNu = 95; OVA = 5.2.</p> <p><u>23.0-26.0':</u> Bedrock sample: SP078723BR.</p> <p><u>26.0-28.5':</u> Readings on core: HNu = 0.4; OVA = 4.0; Ludlum = 2.</p> <p><u>26.0-28.5':</u> Direct hit sample: SP078726DH.</p> <p><u>28.5-31.0':</u> Readings on core: HNu = 0.6; OVA = 0.2; Ludlum = 1.</p> <p><u>28.5-31.0':</u> Field screen readings: HNu = 140(140); OVA = 0.5(0.4).</p> |
| 25 | | | | |
| 30 | | | | |
| 35 | | | | |
| 40 | | | | |

INDEX OF DATA

Boring No.: 39-87BR/SP08-87

Completed as well? Yes

Data in File

- X Log of Borehole
- X Well Construction Summaries
- X Well Development Summaries
- Hydraulic Conductivity Test Data
and Results
- X Packer Test Data and Results
- X Water Level Data
- Saturated Thickness Hydrographs

LOG OF BOREHOLE

Location Rocky Flats Plant; Solar Pond Area
Coordinates N 38094.04 E 22166.32
Total Depth 140.00'

Borehole/Well No. 39-87BR/SP08-87
Ground Surface Elevation 5947.10'
Water Level Encountered _____

Drilling Company Boyles Bros.
Date Drilled Oct. 29-30 and Nov. 6-10, 1987
Drilling Method Hollow Stem Auger; NC Core
Logged By R. Treat; K.D. Holliday
Geologist

Static _____
Driller T. High
Helper B. Keeney
Drilling Fluid None
Checked By _____

Site Manager
CEARP Manager

Comments _____

| Depth Feet | Graphic Log | Sample Type | Lithologic Description | Samples Collected or Other Tests Performed |
|---------------|----------------|----------------|--|--|
| 0 | | | ARTIFICIAL FILL/DISTURBED | |
| | | | <u>0.0-2.0' SAMPLE.</u> Recovered 0.7/2.0' = 35%. GRAVEL AND CLAY: dark dusky brown (5 YR 2/2) to mixed light brown; weakly cemented; subangular, subrounded quartzite gravel; poorly sorted; low plastic; slightly sandy; fine-grained; light moist. | HNu background=0.2. OVA Background=2.8 Ludlum background = 0.0 |
| 5 | | | <u>2.0-3.5' SAMPLE.</u> Recovered 1.5/1.5' = 100%. 2.0-3.2': GRAVEL AND CLAY: dark yellowish orange (10 YR 6/6) to moderate yellowish orange (10 YR 5/4) with gravel to 4.00 mm and larger; sand varying (2.0-1.5 Ø to 0.5-1.0 Ø); light moist. 3.2-3.5': CLAY: dark yellowish orange (10 YR 6/6) moderately cemented; slightly sandy; fine-grained; occasional small scattered gravel; highly plastic; very moist. | <u>0.0-2.0':</u> Field screen readings: HNu = 0.2 (0.2); OVA = 2.8 (2.8). No ludlum readings above background. <u>2.0-3.5':</u> Field screen readings: HNu = 0.2 (0.2); OVA = 2.8 (2.8). No ludlum readings above background. |
| 10 | | | <u>3.5-6.5' SAMPLE.</u> Recovered 3.0/3.0' = 100%. 3.5-5.2': CLAY: moderate brown (5 YR 4/4) to varying gray; considerably oxide stained; low plastic; fine-grained sand (3.0-2.5 Ø); weakly cemented; claystone fragments; moist. | <u>3.5-6.5':</u> Upper contact sample: SP088703UC. <u>6.5-8.5':</u> Contact sample: SP088706CT. |
| 15 | | | ARAPAHOE FORMATION | <u>9.0-11.5':</u> Bedrock sample: SP088709BR. |
| | | | 5.2-6.5': CLAYEY SANDSTONE: light gray (N 7/0); fine-grained sand (3.0-2.5 Ø) and finer; weakly cemented; weathered; moist. | <u>11.5-14.0':</u> Field screen readings: HNu = 0.2 (0.2); OVA = 2.8 (2.8). |
| 20 | | | | <u>14.0-16.5':</u> Field screen readings: HNu = 0.2 (0.2); OVA = 2.8 (2.8). |

LOG OF BOREHOLE

Location _____
Coordinates _____
Total Depth _____

Drilling Company _____
Date Drilled _____
Drilling Method _____
Logged By _____
Geologist

Borehole/Well No. 39-87BR/SP08-87 (con't.)

Ground Surface Elevation _____

Water Level Encountered _____
Static _____

Driller _____

Helper _____

Drilling Fluid _____

Checked By _____

Site Manager

CEARP Manager

Comments _____

| Depth Feet | Graphic Log | Sample Type | Lithologic Description | Samples Collected or Other Tests Performed |
|---------------|----------------|----------------|--|---|
| 20 | | | <u>6.5-9.0' SAMPLE.</u> Recovered 2.0/2.5 = 80%. SANDSTONE: light gray (N 7/0) to severely oxide stained brown; fine-grained sand (3.0-2.5 Ø); weakly cemented; massive; slight clay binder; weathered; moist. | |
| 25 | | | <u>9.0-11.5' SAMPLE.</u> Recovered 2.5/2.5' = 100%. CLAYEY SANDSTONE: varying oxide (Fe) browns to grays; fine-grained sand as above; massive; weakly cemented; weathered; moist. | |
| 30 | | | <u>11.5-14.0' SAMPLE.</u> Recovered 1.5/2.5' = 60%. CLAYEY SANDSTONE: as stated above continued moderately oxide stained; weathered. | |
| 35 | | | <u>14.0-16.5' SAMPLE.</u> Recovered 2.0/2.5' = 80%. CLAYEY SANDSTONE: light gray (N 7/0) to severely oxide stained brown; sand (3.0-2.5 Ø); massive; low plastic; weakly to moderately cemented; weathered; moist. | |
| 40 | | | <u>16.5-19.0' SAMPLE.</u> Recovered 2.3/2.5 = 92%. CLAYEY TO VERY CLAYEY SANDSTONE: oxide stained brown to light gray; low plastic; massive; weakly cemented; weathered; moist. | <u>19.0'</u> : Readings in augers: HNu = 0; OVA = 28. |

LOG OF BOREHOLE

Location _____
Coordinates _____
Total Depth _____

Borehole/Well No. 39-87BR/SP08-87 (con't.)

Ground Surface Elevation _____

Water Level Encountered _____

Static _____

Drilling Company _____

Driller _____

Date Drilled _____

Helper _____

Drilling Method _____

Drilling Fluid _____

Logged By _____

Checked By _____

Geologist

Site Manager

CEARP Manager

Comments _____

| Depth Feet | Graphic Log | Sample Type | Lithologic Description | Samples Collected or Other Tests Performed |
|---------------|----------------|----------------|--|--|
| 40 | | | <u>19.0-21.5' SAMPLE.</u> Recovered 1.4/2.5' = 56%. CLAYEY SANDSTONE: moderately oxide stained to light gray (N 7/0) massive, fine-grained; weathered; moist. | |
| 45 | | | <u>21.5-24.0' SAMPLE.</u> Recovered 1.8/2.5 = 72%. CLAYEY SANDSTONE: light gray (N 7/0) to severely oxide stained brown; low plastic sands (3.5-3.0 Ø to 2.5-2.0 Ø); weakly cemented; massive; moist. | |
| 50 | | | <u>24.0-26.5' SAMPLE.</u> Recovered 1.2/2.5 = 60%. 24.0-25.0': CLAYEY SANDSTONE: as noted above; moist. 25.0-25.2': CLAYSTONE: medium gray (N 4/0); massive; blocky; remaining slightly sandy (3.5-3.0 Ø); low plastic; weathered; moist. | <u>50.10-59.75':</u> Packer Test Interval #10. <u>59.75-69.40':</u> Packer Test Interval # 9. |
| 55 | | | <u>26.5-29.0' SAMPLE.</u> Recovered 2.5/2.5 = 100%. CLAYSTONE: medium gray (N 7 0) massive; medium plastic; slightly blocky; now only slightly oxide stained in streaks at 28.5 and 28.8' for 2" streaks. | |
| 60 | | | <u>29.0-31.5' SAMPLE.</u> Recovered 1.3/2.5 = 52%. SANDY CLAYSTONE: as noted above but now moderately oxide (Fe) stained; massive; medium plastic; weathered; moist. | |

LOG OF BOREHOLE

Location _____
Coordinates _____
Total Depth _____

Drilling Company _____
Date Drilled _____
Drilling Method _____
Logged By _____
Geologist

Borehole/Well No. 39-87BR/SP08-87 (con't.)

Ground Surface Elevation _____

Water Level Encountered _____

Static _____

Driller _____

Helper _____

Drilling Fluid _____

Checked By _____

Site Manager

CEARP Manager

Comments _____

| Depth Feet | Graphic Log | Sample Type | Lithologic Description | Samples Collected or Other Tests Performed |
|---------------|----------------|----------------|---|--|
| 60 | | | <u>31.5-34.0' SAMPLE.</u> Recovered 2.2/2.5' = 88%. SANDY CLAYSTONE: upper formation (31.5-32.0') then slightly sandy, fine-grained; severely oxide stained brown to a light medium gray (N 6/0); massive; low to medium plastic; weathered; blocky; moist. | |
| 65 | | | <u>34.0-36.5' SAMPLE.</u> Recovered 2.5/2.5 = 100%. CLAYSTONE: dark gray (N 3/0) to medium gray (N 5/0); massive; medium plastic; blocky; slightly sandy; fine-grained; moist. | |
| 70 | | | <u>36.5-39.0' SAMPLE.</u> Recovered 1.7/2.5 = 68%. CLAYSTONE: moderate brown (5 YR 4/4) to medium dark gray (N 6/0); massive; blocky; medium plastic; slightly sandy; weathered; streaked, moist. | |
| 75 | | | <u>39.0-41.5' SAMPLE.</u> Recovered 2.2/2.5 = 88%. CLAYSTONE/SHALE: medium dark gray (N 4/0); massive; blocky slightly sandy; fine-grained; medium plastic; moist. | |
| 80 | | | <u>41.5-44.0' SAMPLE.</u> Recovered 1.2/2.5 = 48%. CLAYSTONE/SHALE: medium dark gray (N 4/0); massive; medium plastic somewhat blocky; just slightly sandy; light moist. | <u>69.40-79.05':</u> Packer Test Interval # 8. |

LOG OF BOREHOLE

Location _____
Coordinates _____
Total Depth _____

Drilling Company _____
Date Drilled _____
Drilling Method _____
Logged By _____
Geologist

Borehole/Well No. 39-87BR/SP08-87 (con't.)

Ground Surface Elevation _____

Water Level Encountered _____
Static _____

Driller _____

Helper _____

Drilling Fluid _____

Checked By _____

Site Manager

CEARP Manager

Comments _____

| Depth Feet | Graphic Log | Sample Type | Lithologic Description | Samples Collected or Other Tests Performed |
|---------------|----------------|----------------|---|--|
| 80 | | | <p><u>41.3-45.4' SAMPLE.</u> Recovered 1.68/4.10' = 41%. ROD = 1.04/1.68' = 62%.</p> <p>41.3-41.8': CLAYSTONE PLUG. 41.8-42.35': SILTY CLAYSTONE: dark gray (N 3/0) to olive black (5 Y 2/1); some very fine-grained sand; well sorted; unconsolidated; blocky; soft to medium hardness; damp.</p> <p>42.35-44.03': SANDY SILTY CLAYSTONE: olive black (5 Y 2/1); sand very fine-grained (3.5-4.0 Ø), well sorted; consolidated; blocky; medium hardness; some organics; damp.</p> <p><u>45.4-49.5' SAMPLE.</u> Recovered 4.10/4.10' = 100%. ROD = 3.55/4.10' = 87%.</p> <p>SANDY CLAYSTONE: olive gray (5 Y 4/1) to olive black (5 Y 2/1); sand very fine-grained (3.5-4.0 Ø); well sorted; occasional lenses of a coarser grained sand (3.0-2.5 Ø); pinkish gray (5 YR 8/1) increasing down core when get into sandstone/claystone interbeds; consolidated; hard; at 45.80' have a leaf imprint; occasional organics throughout core; damp.</p> | <p><u>79.05-88.70'</u>: Packer Test Interval # 7.</p> <p><u>88.70-98.35'</u>: Packer Test Interval # 6.</p> <p><u>98.35-108.00'</u>: Packer Test Interval # 5.</p> |
| 85 | | | | |
| 90 | | | | |
| 95 | | | | |
| 100 | | | | |

LOG OF BOREHOLE

Location _____
Coordinates _____
Total Depth _____

Drilling Company _____
Date Drilled _____
Drilling Method _____
Logged By _____
Geologist

Borehole/Well No. 39-87BR/SP08-87 (con't.)

Ground Surface Elevation _____

Water Level Encountered _____

Static _____

Driller _____

Helper _____

Drilling Fluid _____

Checked By _____

Site Manager

CEARP Manager

Comments _____

| Depth Feet | Graphic Log | Sample Type | Lithologic Description | Samples Collected or Other Tests Performed |
|---------------|----------------|----------------|--|--|
| 100 | | | <p><u>49.5-54.0' SAMPLE.</u> Recovered 4.20/4.50' = 93.30%. RQD = 2.70/3.90' = 69%. 49.5-50.7': SANDY CLAYSTONE: olive gray (5 Y 3/2); cuttings from above; moist. 50.7-54.0': SANDY CLAYSTONE: olive gray (5 Y 4/1) to olive black (5 Y 2/1); same as 45.40-49.50' interval; at 52.25' have some fine-grained sand stained dark yellowish orange (10 YR 6/6); lenses of fine-grained sand increase down core; at 53.5'-54.0' clay is predominant; damp.</p> | <p><u>108.00-117.65':</u> Packer Test Interval # 4. <u>115.65-125.30':</u> Packer Test Interval # 3. <u>117.65-127.30':</u> Packer Test Interval # 2. <u>122.68-132.33':</u> Packer Test Interval # 1.</p> |
| 105 | | | <p><u>54.0-57.0' SAMPLE.</u> Recovered 3.3/3.0' = 110%. RQD = 2.45/3.30' = 74%. SANDY CLAYSTONE: same as above with nodules of very pale orange (10 YR 8/2) clay and very fine-grained sand increasing down core; at 56.22' have leaf imprint; less fine-grained sand lenses; damp.</p> | |
| 110 | | | <p><u>57.0-61.0' SAMPLE.</u> Recovered 4.0/4.0' = 100%. RQD = 4.0/4.0' = 100%. SANDY CLAYSTONE: same as above with more fine-grained sand lenses; clay nodules still present; more organics than above; clay increases down core with 60.0-61.0' mostly clay; damp.</p> | |
| 115 | | | <p><u>61.0-65.0' SAMPLE.</u> Recovered 0.0/4.0' = 0%. Lost core.</p> | |
| 120 | | | | |

LOG OF BOREHOLE

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Drilling Company _____

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Date Drilled _____

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Drilling Method _____

Drilling Fluid _____

Logged By _____

Checked By _____

Geologist

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Comments _____

| Depth Feet | Graphic Log | Sample Type | Lithologic Description | Samples Collected or Other Tests Performed |
|---------------|----------------|----------------|---|---|
| 120 | | | <p><u>65.0-66.0' SAMPLE.</u> Recovered 1.5/1.0' = 150%. RQD = 0%. CLAYSTONE: light greenish gray (5 GY 4/1) to dark greenish gray (5 GY 2/1) from 65.0-65.3'; rest of core olive black (5 Y 2/1); trace very fine-grained sand; core mangled from drilling; appears unconsolidated and blocky; damp to moist.</p> | |
| 125 | | | <p><u>66.0-70.0' SAMPLE.</u> Recovered 5.0/4.0' = 125%. RQD = 2.6/5.0' = 52%. 66.0-67.5': CLAYSTONE: olive black (5 Y 2/1) to brownish black (5 YR 2/1); trace silt and very fine-grained sand; some organics; blocky; consolidated; damp. 67.5-68.5': CLAYSTONE: olive black (5 Y 2/1) to brownish black (5 YR 2/1); trace silt and very fine-grained sand; some organics; blocky; consolidated; damp. 68.5-69.5': CLAYSTONE: olive black (5 Y 2/1) to greenish black (5 GY 2/1) to black (N 1/0); trace silt; blocky; damp. 69.5-70.0': CLAYSTONE: medium bluish gray (5 B 5/1) to medium gray (N 5/0); highly plastic; block; moist.</p> | |
| 130 | | | | |
| 135 | | | <p><u>70.0-74.0' SAMPLE.</u> Recovered 0.6/4.0' = 15%. RQD = 0%. CLAYSTONE: olive black (5 Y 2/1) to medium dark gray (N 4/0); blocky; homogenous; plastic; damp.</p> | |
| 140 | | | | |

LOG OF BOREHOLE

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Date Drilled _____

Helper _____

Drilling Method _____

Drilling Fluid _____

Logged By _____

Checked By _____

Geologist

Site Manager

CEARP Manager

Comments _____

| Depth Feet | Graphic Log | Sample Type | Lithologic Description | Samples Collected or Other Tests Performed |
|---------------|----------------|----------------|--|---|
| | | | <u>74.0-76.0' SAMPLE.</u> Recovered 3.85/2.0' = 193%. RQD = 2.26/3.85' = 59%. Picked up 1.85' from previous run. 72.15-74.0': CLAYSTONE: olive black (5 Y 2/1) with lenses of black (N 1/0); blocky, homogenous; plastic; damp. 74.0-76.0': CLAYSTONE: olive black (5 Y 2/1) to medium gray (N 5/0), blocky, homogenous; plastic; damp. | |
| | | | <u>76.0-80.0' SAMPLE.</u> Recovered 2.13/4.0' = 53%. RQD = 1.50/2.13' = 70%. CLAYSTONE: olive black (5 Y 2/1); some silt; some organics; trace very fine-grained sand interbeds; homogenous; blocky; medium hardness; damp. | |
| | | | <u>80.0-82.0' SAMPLE.</u> Recovered 2.62/2.01 = 131%. RQD = 1.62/2.62' = 62%. SANDY CLAYSTONE: olive black (5 Y 2/1); some very fine-grained sand, poorly sorted, subangular to subrounded fine-grained sand occurring in lenses and interbeds; some silt; some organics; small coal seams; blocky; fairly homogenous; medium hardness; damp. | |

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Helper _____

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Drilling Fluid _____

Logged By _____

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Comments _____

| Depth Feet | Graphic Log | Sample Type | Lithologic Description | Samples Collected or Other Tests Performed |
|---------------|----------------|----------------|---|---|
| | | | <u>82.0-84.0' SAMPLE.</u> Recovered 2.38/2.0' = 119%. RQD = 2.15/2.38' = 90%. SANDY CLAYSTONE/CLAYEY SAND- STONE INTERBEDS: olive black (5 Y 2/1) to dark gray (N 3/0); sand very fine- grained to fine-grained, poorly sorted, occurs in lenses and interbeds; occasional stringers of coal in small fractures with no orientation; some silt; some organics; consolidated; medium hardness; from 83.0-84.0' have small lenses of fairly well sorted fine-grained (3.0-2.5 Ø) sand, subrounded; quartzitic, yellowish gray (5 Y 8/1); damp with sand lenses moist. | |
| | | | <u>84.0-86.0' SAMPLE.</u> Recovered 2.0/2.0' = 100%. RQD = 1.76/2.0' = 86%. SANDY CLAYSTONE: olive black (5 Y 2/1) to dark gray (N 3/0) with yellowish gray (5 Y 8/1) fine-grained sand lenses occasional, poorly sorted; occasional stringers of coal; some silt; some organics; consolidated; damp. | |
| | | | <u>86.0-88.0' SAMPLE.</u> Recovered 2.0/2.0' = 100%. RQD = 2.0/2.0' = 100%. SANDY SILTSTONE: same as above except less sand; no coal stringers; damp. | |

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Drilling Company _____
Date Drilled _____
Drilling Method _____
Logged By _____
Geologist

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Helper _____
Drilling Fluid _____
Checked By _____
Site Manager
CEARP Manager

Comments _____

| Depth Feet | Graphic Log | Sample Type | Lithologic Description | Samples Collected or Other Tests Performed |
|---------------|----------------|----------------|--|---|
| | | | <u>88.0-92.0' SAMPLE.</u> Recovered 4.0/4.0' = 100%. RQD = 3.63/4.0' = 91%. 88.0-91.0': SANDY SILTSTONE: olive black (5 Y 2/1) and dark gray (N 3/0); some clay; lots of silt; some very fine-grained fairly well sorted sand with lenses of a fine-grained, well sorted sand; damp. 91.0-92.0': SILTY SANDSTONE: olive black (5 Y 2/1) with yellowish gray (5 Y 8/1) to pinkish gray (5 YR 8/1) fine-grained sand, fairly well sorted; sand in lenses and interbeds; some clay; some organics; small planes of lamination present in sand lenses; consolidated; damp. | |
| | | | <u>92.0-96.0' SAMPLE.</u> Recovered 4.0/4.0' = 100%. RQD = 3.83/4.0' = 96%. 92.0-94.25': SILTY SANDSTONE: olive black (5 Y 2/1) to yellowish gray (5 Y 8/1); very fine-grained to fine-grained sand, fairly well sorted; some planes of lamination; less silt and clay than above; some occasional organics; consolidated; damp. 94.25-95.2': SANDY SILTSTONE/SILTY SANDSTONE: same as above with finer-grained sand; damp. 95.2-96.0': SILTY SANDSTONE: same as 92.0-94.25'; damp. | |

LOG OF BOREHOLE

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Checked By _____

Site Manager

CEARP Manager

Comments _____

| Depth Feet | Graphic Log | Sample Type | Lithologic Description | Samples Collected or Other Tests Performed |
|---------------|----------------|----------------|--|---|
| | | | <u>96.0-100.0' SAMPLE.</u> Recovered 4.3/4.0' = 107%. RQD = 4.0/4.3' = 93%. 96.0-97.35': SANDY SILTSTONE: olive black (5 Y 2/1); very fine-grained sand, fairly well sorted in siltstone matrix; some clay; some organics; some lamination planes; consolidated; at 96.10-96.50' and 97.2-97.35' have lenses of a light olive gray (5 Y 6/1) to olive black (5 Y 2/1), fairly well sorted, moist, fine-grained sand; damp. 97.35-99.0': SILTSTONE: olive black (5 Y 2/1); very fine-grained sand yielding to claystone downcore and disappearing at 98.85'; consolidated; some clay; lots silt; occasional nodules of grayish orange (10 YR 7/4) clay, prominent from 97.35-98.0'; some organics; damp. 99.0-100.0': CLAYEY SILTSTONE: olive black (5 Y 2/1); trace very fine-grained sand; lots of silt; lots of clay; consolidated; some organics; occasional grayish orange (10 YR 7/4) nodules of clay; damp. | |

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Comments _____

| Depth Feet | Graphic Log | Sample Type | Lithologic Description | Samples Collected or Other Tests Performed |
|---------------|----------------|----------------|---|---|
| | | | <u>100.0-104.0' SAMPLE.</u> Recovered 2.61/4.0' = 65.3%. RQD = 2.50/2.61' = 96%. 100.0-101.0': CLAYEY SILTSTONE: olive black (5 Y 2/1); trace very fine-grained sand; fairly homogenous; consolidated; damp. 101.0-101.5': SILTY SANDSTONE: yellowish gray (5 Y 8/1) to olive black (5 Y 2/1); sand from very fine-grained in upper portion to fine-grained in lower portion fairly well sorted, subrounded; some silt; little clay; consolidated; damp to moist. 101.5-102.61': CLAYSTONE: medium dark gray (N 4/0) to dark gray (N 3/0); highly plastic; blocky; homogenous; no silt or sand; damp to moist. | |
| | | | <u>104.0-108.0' SAMPLE.</u> Recovered 4.0/4.0' = 100%. RQD = 3.27/4.0' = 82%. CLAYSTONE: olive black (5 Y 2/1) to dark gray (N 3/0); trace silt; blocky; homogenous; damp to moist. | |

LOG OF BOREHOLE

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Coordinates _____
Total Depth _____

Borehole/Well No. 39-87BR/SP08-87 (con't.)
Ground Surface Elevation _____
Water Level Encountered _____
Static _____

Drilling Company _____
Date Drilled _____
Drilling Method _____
Logged By _____
Geologist

Driller _____
Helper _____
Drilling Fluid _____
Checked By _____
Site Manager
CEARP Manager

Comments _____

| Depth Feet | Graphic Log | Sample Type | Lithologic Description | Samples Collected or Other Tests Performed |
|---------------|----------------|----------------|---|---|
| | | | <u>108.0-112.0' SAMPLE.</u> Recovered 3.9/4.0' = 98%. RQD = 3.49/3.9' = 89.5%. 108.0-110.0': SILTSTONE: olive black (5 Y 2/1); some very fine-grained sand; some clay; some organics; fairly homogenous; consolidated; hard; more sand down core; damp. 110.0-111.90': SANDSTONE: dark greenish gray (5 G 4/1) to greenish gray (5 GY 6/1) with some yellowish gray (5 Y 8/1); very fine-grained (3.5-4.0 Ø) to fine-grained (3.0-2.5 Ø); fairly well sorted; subangular to subrounded; some silt; trace clay; some leaf and plant stem organics, increases down core; sand fines as goes down core with occasional lenses of the coarser grains; massive; damp to moist. | |

LOG OF BOREHOLE

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Total Depth _____

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Water Level Encountered _____

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Drilling Company _____

Driller _____

Date Drilled _____

Helper _____

Drilling Method _____

Drilling Fluid _____

Logged By _____

Checked By _____

Geologist

Site Manager

CEARP Manager

Comments _____

| Depth Feet | Graphic Log | Sample Type | Lithologic Description | Samples Collected or Other Tests Performed |
|---------------|----------------|----------------|---|---|
| | | | <u>112.0-116.0' SAMPLE.</u> Recovered 4.67/4.0' = 117%. RQD = 3.23/4.67' = 69%. 112.0-112.5': SANDY SILTSTONE: olive black (5 Y 2/1); 40% silt; 40% organics; 20% sand; consolidated; damp to moist. 112.5-115.75': SANDSTONE: greenish gray (5 GY 6/1) to dark greenish gray (5 G 4/1) with some yellowish gray (5 Y 8/1); fine-grained (3.0-2.0 Ø) to medium- grained (2.0-1.5 Ø) sand, fining down core; occasional lenses of clay and silt associated with organics occurring throughout the core; sand massive with zones of contorted bedding; consolidated; at 112.75' have a fracture of coal with small fractures of coal or organics occur- ring throughout the core; damp to moist. 115.75-116.0': SILTY SANDSTONE: olive black (5 Y 2/1); very silty; sand fine- grained to medium-grained as above. occurring in lenses; many organics with clay associated; very hard; consolidated; damp. | |

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Ground Surface Elevation _____

Water Level Encountered _____

Static _____

Driller _____

Helper _____

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CEARP Manager

Comments _____

| Depth Feet | Graphic Log | Sample Type | Lithologic Description | Samples Collected or Other Tests Performed |
|---------------|----------------|----------------|--|---|
| | | | <u>116.0-120.0' SAMPLE.</u> Recovered 2.0/4.0' = 50%. RQD = 0.45/2.0' = 22.5%. 116.0-116.3': CUTTINGS OF SILTSTONE AND CLAYSTONE: reworked. 116.3-116.9': SANDY SILTSTONE: olive black (5 Y 2/1) with yellowish gray (5 Y 8/1) and greenish gray (5GY 6/1) fine- grained sand in lenses; some clay; some organics; massive; consolidated; damp to moist. 116.9-118.0': CLAYEY SANDY SILT- STONE: olive black (5 Y 2/1); heavy silt influence; sand is very fine-grained; some organics; massive; consolidated; damp. | |

LOG OF BOREHOLE

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Driller _____

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Drilling Fluid _____

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Comments _____

| Depth Feet | Graphic Log | Sample Type | Lithologic Description | Samples Collected or Other Tests Performed |
|---------------|----------------|----------------|---|---|
| | | | <p><u>120.0-122.0' SAMPLE.</u> Recovered 4.6/2.0' = 230%. RQD 3.97/4.6' = 86%. 118.0-120.0': CLAYEY SILTSTONE: olive black (5 Y 2/1) to greenish black (5 GY 2/1); trace very fine-grained sand; some organics; occasional seams of coal; massive; blocky; fairly homogenous; consolidated; damp. 120.0-121.4': CLAYEY SILTSTONE: dark greenish gray (5 G 4/1) to greenish black (5 GY 2/1); trace very fine-grained sand in lenses; some organics; massive; consolidated; damp. 121.4-122.0': SANDSTONE: dark greenish gray (5 G 4/1) to greenish black (5 GY 2/1); some silt in top of core giving way to sand; fine-grained to medium-grained (2.0-1.5 Ø) sand, subrounded to subangular; feldspathic and quartzitic; fairly well sorted; massive; homogenous; consolidated; few organics; damp to moist.</p> | |

LOG OF BOREHOLE

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| Depth Feet | Graphic Log | Sample Type | Lithologic Description | Samples Collected or Other Tests Performed |
|---------------|----------------|----------------|--|---|
| | | | <u>122.0-126.0' SAMPLE.</u> Recovered 4.0/4.0' = 100%. RQD = 3.65/4.0' = 91%. 122.0-122.85': SANDSTONE: greenish gray (5 G 6/1) to greenish black (5 G 2/1); some silt; fine-grained to medium-grained (2.5-1.5 Ø) sand, subrounded to subangular, fairly well sorted; some organics; massive; consolidated; moist. 122.85-126.0': SANDSTONE/SILTSTONE: greenish gray (5 G 6/1) to greenish black (5 G 2/1); very fine-grained sand with lenses of fine-grained to medium-grained sand as above (122.0-122.85'); some organics more than above; clay influence with organics; sand decreases down core giving way to more silt, a little clay, and more organics; massive; consolidated; damp. | |
| | | | <u>126.0-130.0' SAMPLE.</u> Recovered 1.5/4.0' = 37.5%. RQD = 0.75/1.5' = 50%. SANDSTONE: medium dark gray (N 4/0) to light gray (N 7/0); very fine-grained to fine-grained (3.5-2.5 Ø) feldspathic and quartzitic sand; fairly well sorted; massive; occasional trace lamination planes; sand fines down core; some organics; some silt; from 127.3-127.5' have zone of clay influence; moist to wet. | |

LOG OF BOREHOLE

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Ground Surface Elevation _____

Water Level Encountered _____

Static _____

Driller _____

Helper _____

Drilling Fluid _____

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Site Manager

CEARP Manager

Comments _____

| Depth Feet | Graphic Log | Sample Type | Lithologic Description | Samples Collected or Other Tests Performed |
|---------------|----------------|----------------|--|---|
| | | | <u>130.0-132.0' SAMPLE</u> Recovered 4.35/2.0' = 217.5%. RQD = 3.68/4.35' = 84.6%. 127.5-129.4': CLAYEY SILTSTONE: dark greenish gray (5 G 4/1) to greenish black (5 G 2/1); no organics, hard; massive; fairly homogenous; consolidated; damp to dry. 129.4-129.7': SILTY CLAYSTONE: same as above; damp to dry. 129.7-130.0': SILTY SANDSTONE: same as above with some clay; very fine-grained sand; moist. 130.0-132.0': SILTY SANDSTONE: dark greenish gray (5 G 4/1) to greenish gray (5 G 6/1); very fine-grained (3.5-4.0 Ø) to fine-grained (3.0-2.5 Ø), fairly well sorted sand; some silt; massive; consolidated; damp to moist. | |
| | | | <u>132.0-136.0' SAMPLE</u> Recovered 4.18/4.0' = 104.5%. RQD = 3.76/4.18' = 90%. 132.0-132.4': SANDSTONE: dark greenish gray (5 G 4/1) to greenish gray (5 G 6/1); fine-grained (2.0-3.0 Ø) sand; fairly well sorted; some silt; massive; consolidated; damp. 132.4-136.0': SILTY CLAYSTONE: dark greenish gray (5 G 4/1) to greenish gray (5 G 6/1); trace very fine-grained sand; silt in top of core gives way to clay down core; fairly homogenous; massive; consolidated; hard; no organics; damp. | |

LOG OF BOREHOLE

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Borehole/Well No. 39-87BR/SP08-87 (con't.)

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Comments _____

| Depth Feet | Graphic Log | Sample Type | Lithologic Description | Samples Collected or Other Tests Performed |
|---------------|----------------|----------------|---|---|
| | | | <u>136.0-140.0' SAMPLE.</u> Recovered 2.0/4.0' = 50%. RQD = 0.6/2.0' = 30%. CLAYSTONE: medium gray (N 5/0) to dark gray (N 3/0); some silt; homogenous; massive; blocky; no organics; damp. TOTAL DEPTH: 140.00'. | |

WELL COMPLETION INFORMATION

Location: Rocky Flats Plant; Solar Ponds Area

Well No. 39-87BR/SP08-87

Coordinates N 38094.04 E 22166.32

Elevation: Ground Surface 5947.10'

Total Depth: Well 117.39'

Top of Casing 5949.12'

Borehole 140.00'

Formation of Completion Arapahoe Formation

Casing Material Sch 5, Type 316, TFJ Stainless Steel

Casing Diameter 2" ID

Screen Material 0.010" wire wrap, Type 316, TFJ Stainless Steel

Surface Casing Diameter 5" ID

Date Installed November 17-18, 1987

Approved By _____

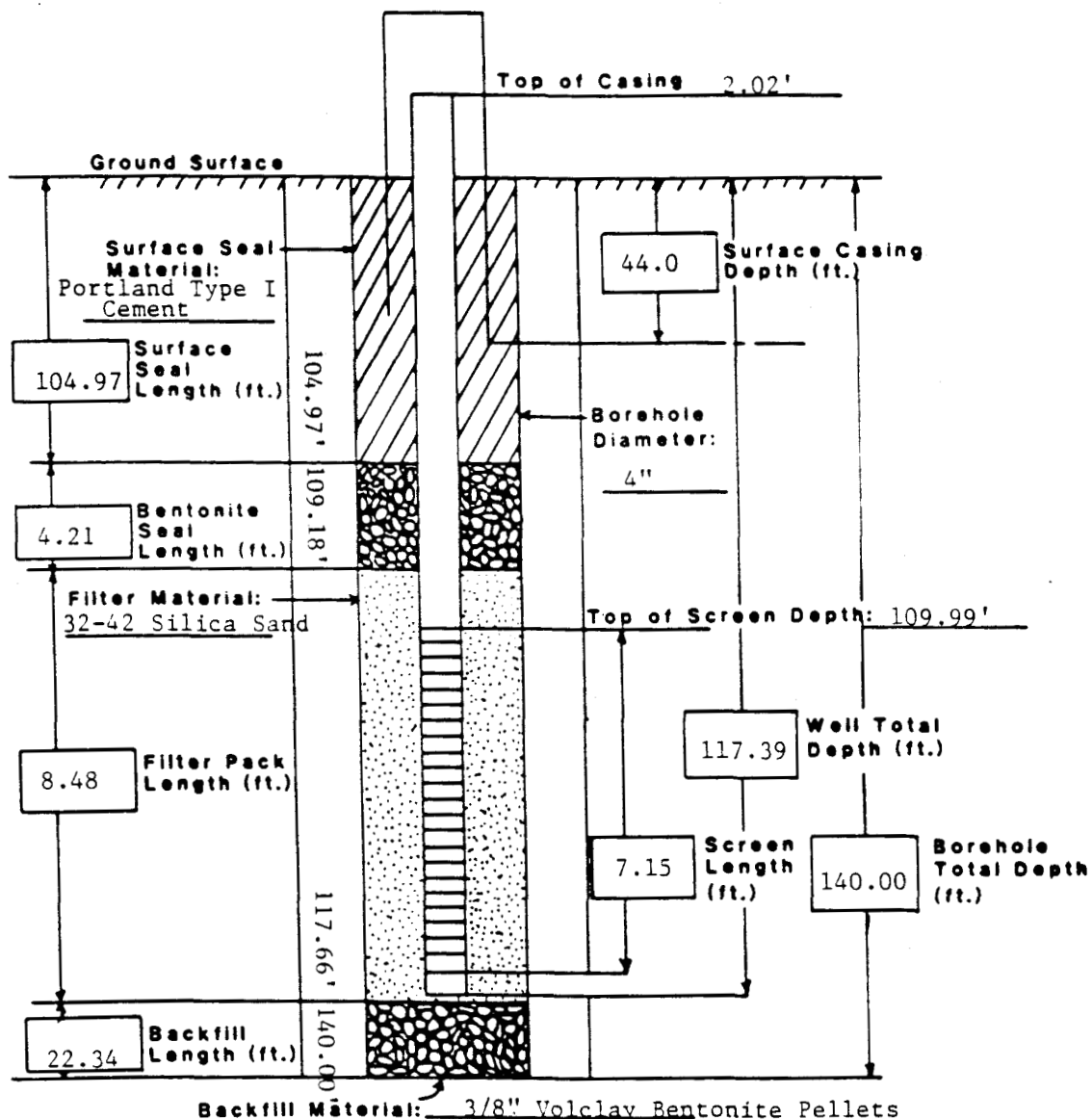
Installed By K.D. Holliway

Geologist

Site Manager

CEARP Manager

Comments Surface casing set to 44.0' by R. Treat on October 30, 1987.



Well No.: 39-87BR

WELL DEVELOPMENT SUMMARY SHEET

[illegible]

PACKER TEST DATA SHEET

Job No.: 2029-17-02 Static Water Level: 83.98'

Location: Rocky Flats Plant; Solar Ponds Area Date of Water Level: 4/18/88

Well No.: 39-87BR Page 1 of 2

Borehole Diameter: 0.333' Comments: Interval #2 (117.65 - 127.30') failed

Acrylic Tube Diameter: 0.1663'

| Test Interval No. | Top of Test Interval | Bottom of Test Interval | Test Length (minutes) | Gage Pressure | Gage Height | Avg. H ₂ O Height | Gage Height + Avg. H ₂ O Height | Δh | Date of Test | Lithology | Geologist |
|-------------------|----------------------|-------------------------|-----------------------|---------------|-------------|------------------------------|--|------------|--------------|-----------|-----------|
| 1 | 122.68 | 132.33 | 15 | 0 | 5.90 | 4.25 | 10.15 | 0.03 | 11/11/87 | Kass | KDH |
| | | | 15 | 29.7 | 5.90 | - | 5.90 | 0.12 | 11/11/87 | Kass | KDH |
| | | | 15 | 0 | 5.90 | 2.712 | 8.702 | -0.02 | 11/11/87 | Kass | KDH |
| 3 | 115.65 | 125.30 | 15 | 0 | 5.90 | 3.94 | 9.84 | -0.08 | 11/11/87 | Kass | KDH |
| | | | 15 | 28 | 5.90 | - | 5.90 | 1.21 | 11/11/87 | Kass | KDH |
| | | | 15 | 0 | 5.90 | 2.528 | 8.428 | -0.095 | 11/11/87 | Kass | KDH |
| 4 | 108.00 | 117.65 | 15 | 0 | 5.90 | 4.172 | 10.162 | -0.025 | 11/11/87 | Kass | KDH |
| | | | 15 | 26 | 5.90 | - | 5.90 | 0.18 | 11/11/87 | Kass | KDH |
| | | | 15 | 0 | 5.90 | 3.558 | 9.458 | -0.01 | 11/11/87 | Kass | KDH |
| 5 | 98.35 | 108.00 | 15 | 0 | 5.90 | 3.904 | 9.804 | -0.01 | 11/12/87 | KCL | KDH |
| | | | 15 | 24 | 5.90 | - | 5.90 | 0.11 | 11/12/87 | KCL | KDH |
| | | | 15 | 0 | 5.90 | 2.519 | 8.419 | -0.035 | 11/12/87 | KCL | KDH |
| 6 | 88.70 | 98.35 | 15 | 0 | 5.90 | 5.638 | 11.538 | -0.010 | 11/12/87 | KCL | KDH |
| | | | 15 | 21.7 | 5.90 | - | 5.90 | 0.07 | 11/12/87 | KCL | KDH |
| | | | 15 | 0 | 5.90 | 5.537 | 11.437 | -0.015 | 11/12/87 | KCL | KDH |
| 7 | 79.05 | 88.70 | 15 | 0 | 5.90 | 4.437 | 10.337 | 0.02 | 11/12/87 | KCL | KDH |
| | | | 15 | 19.4 | 5.90 | - | 5.90 | 0.08 | 11/12/87 | KCL | KDH |
| | | | 15 | 0 | 5.90 | 4.228 | 10.128 | -0.015 | 11/12/87 | KCL | KDH |

PACKER TEST DATA SHEET

Job No.: 2029-17-02

Static Water Level: _____

Location: Rocky Flats Plant; Solar Ponds Area

Date of Water Level: _____

Well No.: 39-87BR (cont'd.)

Page 2 of 2

Borehole Diameter:

Comments:

Borehole Diameter:

Acrylic Tube Diameter:

[illegible]

PACKER TEST ANALYSIS

WELL NO. 39-87BR

ROCKY FLATS PLANT; SOLAR POND AREA JOB NO. 2029-17-02

DATE TESTED: 11/12/87 BY: KD HOLLIWAY

TEST INTERVAL (FEET BELOW G.S.): 50.10 - 59.75

MATERIAL TESTED: ARAPAHOE CLAYSTONE

DEPTH TO WATER (FEET BELOW G.S.): 83.98

$$K = \frac{Q}{2(P_1)(L)(H)} \ln\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

TEST ABORTED

P2/3 TEST

Q = INJECTION RATE = .00007240 (FEET³/MIN)

L = LENGTH OF TEST INTERVAL = 9.65 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 54.92 + 5.90 + 15.08 * 2.31 = 95.66

R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000005 FT/MIN

K = .00000003 CM/SEC

2ND P1/3 TEST

TEST ABORTED

PACKER TEST ANALYSIS

WELL NO. 39-87BR

ROCKY FLATS PLANT; SOLAR POND AREA JOB NO. 2029-17-02

DATE TESTED: 11/12/87 BY: KD HOLLIWAY

TEST INTERVAL (FEET BELOW G.S.): 59.75 - 69.40

MATERIAL TESTED: ARAPAHOE CLAYSTONE

DEPTH TO WATER (FEET BELOW G.S.): 83.98

$$K = \frac{Q}{2(\pi)(L)(H)} \ln\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00000000 (FEET³/MIN)

L = LENGTH OF TEST INTERVAL = 9.65 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 64.57 + 9.96 + .00 * 2.31 = 74.53

R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000000 FT/MIN

K = .00000000 CM/SEC

NOTE: NO WATER GAIN OR LOSS IN INJECTION TUBE;

Q=0

P2/3 TEST

Q = INJECTION RATE = .00018825 (FEET³/MIN)

L = LENGTH OF TEST INTERVAL = 9.65 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 64.57 + 5.90 + 14.80 * 2.31 = 104.66

R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000012 FT/MIN

K = .00000006 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00000000 (FEET³/MIN)

L = LENGTH OF TEST INTERVAL = 9.65 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 64.57 + 8.71 + .00 * 2.31 = 73.28

R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000000 FT/MIN

K = .00000000 CM/SEC

NOTE: NO WATER GAIN OR LOSS IN INJECTION TUBE

Q=0

PACKER TEST ANALYSIS
WELL NO. 39-87BR
ROCKY FLATS PLANT; SOLAR POND AREA JOB NO. 2029-17-02
DATE TESTED: 11/12/87 BY: KD HOLLIWAY
TEST INTERVAL (FEET BELOW G.S.): 69.40 - 79.05
MATERIAL TESTED: ARAPAHOE CLAYSTONE
DEPTH TO WATER (FEET BELOW G.S.): 83.98

$$K = \frac{Q}{2(\pi)(L)(H)} \ln\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00000000 (FEET³/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 74.23 + 9.58 + .00 * 2.31 = 83.81
R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000000 FT/MIN
K = .00000000 CM/SEC

NOTE: NO WATER GAIN OR LOSS IN INJECTION TUBE;
Q=0

P2/3 TEST

Q = INJECTION RATE = .00014480 (FEET³/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 74.23 + 5.90 + 17.10 * 2.31 = 119.63
R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000008 FT/MIN
K = .00000004 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00000000 (FEET³/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 74.23 + 7.66 + .00 * 2.31 = 81.89
R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000000 FT/MIN
K = .00000000 CM/SEC

NOTE: NO WATER GAIN OR LOSS IN INJECTION TUBE;
Q=0

PACKER TEST ANALYSIS
WELL NO. 39-87BR
ROCKY FLATS PLANT; SOLAR POND AREA JOB NO. 2029-17-02
DATE TESTED: 11/12/87 BY: KD HOLLIWAY
TEST INTERVAL (FEET BELOW G.S.): 79.05 - 88.70
MATERIAL TESTED: ARAPAHOE CLAYSTONE
DEPTH TO WATER (FEET BELOW G.S.): 83.98

$$K = \frac{Q}{2(\pi)(L)(H)} \frac{L}{\ln\left(\frac{L}{R}\right)}$$

1ST P1/3 TEST

Q = INJECTION RATE = .00002896 (FEET³/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 83.88 + 10.34 + .00 * 2.31 = 94.21
R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000002 FT/MIN
K = .00000001 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00011584 (FEET³/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 83.88 + 5.90 + 19.40 * 2.31 = 134.59
R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000006 FT/MIN
K = .00000003 CM/SEC

2ND P1/3 TEST

TEST ABORTED

PACKER TEST ANALYSIS

WELL NO. 39-87BR

ROCKY FLATS PLANT; SOLAR POND AREA JOB NO. 2029-17-02

DATE TESTED: 11/12/87 BY: KD HOLLIWAY

TEST INTERVAL (FEET BELOW G.S.): 88.70 - 98.35

MATERIAL TESTED: ARAPAHOE CLAYSTONE

DEPTH TO WATER (FEET BELOW G.S.): 83.98

$$K = \frac{Q}{2(P_i)(L)(H)} \ln\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

TEST ABORTED

P2/3 TEST

Q = INJECTION RATE = .00010136 (FEET³/MIN)

L = LENGTH OF TEST INTERVAL = 9.65 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 83.98 + 5.90 + 21.70 * 2.31 = 140.01

R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000005 FT/MIN

K = .00000002 CM/SEC

2ND P1/3 TEST

TEST ABORTED

PACKER TEST ANALYSIS

WELL NO. 39-87BR

ROCKY FLATS PLANT; SOLAR POND AREA JOB NO. 2029-17-02

DATE TESTED: 11/12/87 BY: KD HOLLIWAY

TEST INTERVAL (FEET BELOW G.S.): 98.35 - 108.00

MATERIAL TESTED: ARAPAHOE CLAYSTONE

DEPTH TO WATER (FEET BELOW G.S.): 83.98

$$K = \frac{Q}{2(\pi)(L)(H)} \ln\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

TEST ABORTED

P2/3 TEST

Q = INJECTION RATE = .00015929 (FEET³/MIN)

L = LENGTH OF TEST INTERVAL = 9.65 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 83.98 + 5.90 + 24.00 * 2.31 = 145.32

R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000007 FT/MIN

K = .00000004 CM/SEC

2ND P1/3 TEST

TEST ABORTED

PACKER TEST ANALYSIS
WELL NO. 39-87BR
ROCKY FLATS PLANT; SOLAR POND AREA JOB NO. 2029-17-02
DATE TESTED: 11/11/87 BY: KD HOLLIWAY
TEST INTERVAL (FEET BELOW G.S.): 108.00 - 117.65
MATERIAL TESTED: ARAPAHOE SANDSTONE
DEPTH TO WATER (FEET BELOW G.S.): 83.98

$$K = \frac{Q}{2(\pi)(L)(H)} \ln\left(\frac{L}{R}\right)$$

1ST P1/3 TEST
TEST ABORTED

P2/3 TEST

Q = INJECTION RATE = .00026065 (FEET³/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 83.98 + 5.90 + 26.00 * 2.31 = 149.94
R = BOREHOLE RADIUS = .17 FEET
K = HYDRAULIC CONDUCTIVITY = .00000012 FT/MIN
K = .00000006 CM/SEC

2ND P1/3 TEST
TEST ABORTED

PACKER TEST ANALYSIS

WELL NO. 39-87BR

ROCKY FLATS PLANT; SOLAR POND AREA JOB NO. 2029-17-02

DATE TESTED: 11/11/87 BY: KD HOLLIWAY

TEST INTERVAL (FEET BELOW G.S.): 115.65 - 125.30

MATERIAL TESTED: ARAPAHOE SANDSTONE

DEPTH TO WATER (FEET BELOW G.S.): 83.98

$$K = \frac{Q}{2(P_i)(L)(H)} \ln\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

TEST ABORTED

P2/3 TEST

Q = INJECTION RATE = .00175214 (FEET³/MIN)

L = LENGTH OF TEST INTERVAL = 9.65 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 83.98 + 5.90 + 28.00 * 2.31 = 154.56

R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000076 FT/MIN

K = .00000039 CM/SEC

2ND P1/3 TEST

TEST ABORTED

PACKER TEST ANALYSIS
WELL NO. 39-87BR
ROCKY FLATS PLANT; SOLAR POND AREA JOB NO. 2029-17-02
DATE TESTED: 11/11/87 BY: KD HOLLIWAY
TEST INTERVAL (FEET BELOW G.S.): 122.68 - 132.33
MATERIAL TESTED: ARAPAHOE SANDSTONE
DEPTH TO WATER (FEET BELOW G.S.): 83.98

$$K = \frac{Q}{2(\pi)(L)(H)} \ln\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00004344 (FEET³/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 83.98 + 10.15 + .00 * 2.31 = 94.13
R = BOREHOLE RADIUS = .17 FEET
K = HYDRAULIC CONDUCTIVITY = .00000003 FT/MIN
K = .00000002 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00017377 (FEET³/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 83.98 + 5.90 + 29.70 * 2.31 = 158.49
R = BOREHOLE RADIUS = .17 FEET
K = HYDRAULIC CONDUCTIVITY = .00000007 FT/MIN
K = .00000004 CM/SEC

2ND P1/3 TEST

TEST ABORTED

ROCKY FLATS SOLAR PONDS

WATER LEVEL SUMMARY

| <u>WELL</u> <u>NUMBER</u> | <u>DATE</u> | <u>GROUND</u> <u>SURFACE</u> <u>ELEVATION</u> | <u>TOP OF</u> <u>CASING</u> <u>ELEVATION</u> | <u>STICK</u> <u>UP</u> | <u>DEPTH</u> <u>OF SI</u> <u>BASE</u> | <u>WATER</u> <u>DEPTH</u> <u>BELOW TOC</u> | <u>WATER</u> <u>SURFACE</u> <u>ELEVATION</u> |
|------------------------------|-------------|---|--|---------------------------|---|--|--|
| 3987 | 11/12/87 | 5947.10 | 5949.12 | 2.02 | 117.14 | 23.90 | 5925.22 |
| | 12/22/87 | | | | | 23.60 | 5925.52 |
| | 02/01/88 | | | | | 40.20 | 5908.92 |
| | 02/29/88 | | | | | 46.60 | 5902.52 |
| | 03/21/88 | | | | | 108.6 | 5840.52 |
| | 04/18/88 | | | | | 86.00 | 5863.12 |

INDEX OF DATA

Boring No.: SP09-87

Completed as well? No

Data in File

- ☒ Log of Borehole
- ☐ Well Construction Summaries
- ☐ Well Development Summaries
- ☐ Hydraulic Conductivity Test Data and Results
- ☐ Packer Test Data and Results
- ☐ Water Level Data
- ☐ Saturated Thickness Hydrographs

LOG OF BOREHOLE

Location Rocky Flats Plant; Solar Ponds Area

Coordinates * N 38144 E 21872

Total Depth 11.0'

Borehole/Well No. SP09-87

Ground Surface Elevation *5945.0'

Water Level Encountered None

Static

Drilling Company Boyles Bros.

Date Drilled November 2, 1987

Drilling Method Hollow Stem Auger

Logged By R. Treat

Geologist

Driller T. High

Helper B. Keeney

Drilling Fluid None

Checked By

Site Manager

CEARP Manager

Comments Borehole backfilled with Portland Type I Cement.

*Coordinates and elevation estimated from topographic map.

| Depth Feet | Graphic Log | Sample Type | Lithologic Description | Samples Collected or Other Tests Performed |
|---------------|----------------|----------------|---|--|
| 0 | | | <u>ARTIFICIAL FILL/DISTURBED</u> | |
| | | | <u>0.0-1.5' SAMPLE.</u> Recovered 1.3/1.5' = 87%. CLAY: dusky brown (5 YR 2/2); sandy with organic roots; few scattered gravels; low plastic; moist. | |
| | | | <u>1.5-3.0' SAMPLE.</u> Recovered 1.1/1.5' = 73%. 1.5-1.7': CLAY: moderate yellowish brown (10 YR 5/4); fine-grained sand as noted above; moist. 1.7-2.6': SAND AND GRAVEL: few scattered gravels; varying light brown to medium dark brown; weakly cemented; poorly sorted; rounded and subrounded gravels ranging 0.75 mm to 4.25 mm; quartzose composition; light moist. | HNu Background=0.3 OVA Background=0.0 Ludlum Background = 0.0 |
| 5 | | | <u>3.0-6.0' SAMPLE.</u> Recovered 2.1/3.0' = 70%. 3.0-4.2': SAND AND GRAVEL: mixed yellowish brown (10 YR 5/4); moderately oxide stained; fine- and medium-grained sand (2.5-2.0 ϕ to 0.0-0.5 ϕ); gravel subrounded and rounded quartzite; weakly cemented; lightly moist. 4.2-5.1': CLAY: yellowish gray (5 YR 7/2) to light olive brown (5 Y 5/6); moderately calcareous; highly plastic; moderately cemented; moist. | <u>0.0-1.3'</u> : Field screen readings: HNu = 0.0(0.0); OVA = 0.0(0.0). <u>1.5-2.6'</u> : Field screen readings: HNu = 0.0(0.0); OVA = 0.0(0.0). |
| 10 | | | <u>ARAPAHOE FORMATION</u> | <u>3.0-5.1'</u> : Upper contact sample: SP098703UC. <u>6.0-8.5'</u> : Contact sample: SP098706CT. |
| | | | <u>6.0-8.5' SAMPLE.</u> Recovered 3.5/2.5' = 140%. CLAYSTONE: medium gray (N 5/0); slightly oxide stained; medium plastic; blocky; weathered; massive; moist. | <u>8.5-11.0'</u> : Bedrock sample: SP0987088R. |
| 15 | | | <u>8.5-11.0' SAMPLE.</u> Recovered 2.5/2.5' = 100%. CLAYSTONE: sandy; medium gray (N 5/0); fine-grained sand (3.5-3.0 ϕ); low plastic; massive; blocky; moderately oxide stained levels; weathered; moist. | <u>8.5-11.0'</u> : Field screen reading: HNu = 0.0(0.0); OVA = 0.0(0.0). |
| | | | TOTAL DEPTH: 11.0' | |
| 20 | | | | |

INDEX OF DATA

Boring No.: SP10-87

Completed as well? No

Data in File

- ☒ Log of Borehole
- ☐ Well Construction Summaries
- ☐ Well Development Summaries
- ☐ Hydraulic Conductivity Test Data and Results
- ☐ Packer Test Data and Results
- ☐ Water Level Data
- ☐ Saturated Thickness Hydrographs

LOG OF BOREHOLE

Location Rockv Flats Plant; Solar Ponds Area

Coordinates * N 38185 E 21480

Total Depth 22.7'

Borehole/Well No. SP10-87

Ground Surface Elevation *5941.0'

Water Level Encountered 21.0'

Static

Drilling Company Bovles Bros.

Date Drilled November 9-11, 1987

Drilling Method Hollow Stem Auger

Logged By J. Bacchus
Geologist

Driller R. Sharp

Helper T. Merritt

Drilling Fluid None

Checked By _____
Site Manager

CEARP Manager

Comments Borehole backfilled with Portland Type I Cement.

*Coordinates and elevation estimated from topographic map.

| Depth Feet | Graphic Log | Sample Type | Lithologic Description | Samples Collected or Other Tests Performed |
|---------------|----------------|----------------|--|--|
| 0 | | | <u>ARTIFICIAL FILL/DISTURBED</u> | |
| | | | <u>0.0-2.0' SAMPLE.</u> Recovered 1.8/2.0' = 90%. CLAY: dark yellowish brown (10 YR 4/2) mottled with dark yellowish orange (10 YR 6/6); silt and sand; abundant roots at the top; caliche; moist. | <u>0.0-1.8':</u> Direct hit sample: SP108700DH. |
| | | | <u>2.0-4.0' SAMPLE.</u> Recovered 1.9/2.0' = 95%. 2.0-2.4': CLAY: same as above. | <u>2.0-3.9':</u> Direct hit sample: SP108702DH. |
| 5 | | | <u>ARAPAHOE FORMATION</u> | <u>4.0-5.0':</u> Direct hit sample: SP1087048R. |
| | | | 2.4-3.9': CLAYSTONE: dark yellowish orange (10 YR 6/6) mottled with very pale yellowish orange (10 YR 8/6) and pale olive (10 Y 6/2); sandy; caliche; moist. | <u>5.0-7.0':</u> Direct hit sample: SP108705DH. |
| | | | <u>4.0-5.0' SAMPLE.</u> Recovered 1.6/1.0' = 160%. CLAYSTONE: same as above; moist. | <u>7.0-9.0':</u> Direct hit sample: SP108707DH. |
| 10 | | | <u>5.0-7.0' SAMPLE.</u> Recovered 2.2/2.0' = 91%. CLAYSTONE: same as above, except less sand, less caliche, and slightly less oxidation. | <u>9.0-11.0':</u> Direct hit sample: SP108709DH. |
| | | | <u>7.0-9.0' SAMPLE.</u> Recovered 2.2/2.0' = 110%. CLAYSTONE: Same as above except more consolidated; no caliche; moist. | <u>11.0-13.0':</u> Direct hit sample: SP108711DH. |
| | | | <u>9.0-11.0' SAMPLE.</u> Recovered 2.0/2.0' = 100%. CLAYSTONE: Same as above except moist to dry. | <u>13.0-14.9':</u> Direct hit sample: SP108713DH. |
| 15 | | | <u>11.0-13.0' SAMPLE.</u> Recovered 2.0/2.0' = 100%. CLAYSTONE: light olive gray (5 Y 5/2) mottled with dark yellowish orange (10 YR 6/6); blocky structure; some fine-grained sand; slightly moist. | |
| | | | <u>13.0-15.0' SAMPLE.</u> Recovered 1.9/2.0' = 95%. SANDSTONE: light olive gray (5 Y 5/2) mottled with dark yellowish orange (10 YR 6/6); fine-grained; high amount of clay; no HCl reaction; dry. | |
| 20 | | | | |

LOG OF BOREHOLE

Location Rocky Flats Plant; Solar Ponds Area

Coordinates _____

Total Depth _____

Drilling Company _____

Date Drilled _____

Drilling Method _____

Logged By _____

Geologist

Borehole/Well No. SP10-87(cont'd.)

Ground Surface Elevation _____

Water Level Encountered _____

Static _____

Driller _____

Helper _____

Drilling Fluid _____

Checked By _____

Site Manager

CEARP Manager

Comments _____

| Depth Feet | Graphic Log | Sample Type | Lithologic Description | Samples Collected or Other Tests Performed |
|---------------|----------------|----------------|--|--|
| 20 | | | <p><u>15.0-17.0' SAMPLE.</u> Recovered 1.9/2.0' = 95%. SANDSTONE: same as above except less clay, coarser sand; sand gets coarser at bottom.</p> <p><u>17.0-19.0' SAMPLE.</u> Recovered 2.2/2.0' = 110%. CLAYSTONE: light olive gray (5 Y 5/2) and dark yellowish orange (10 YR 6/6); very sandy, fining downward; coarse sand at the top, clay at the bottom; dry.</p> <p><u>19.0-21.0' SAMPLE.</u> Recovered 2.2/2.0' = 110%. CLAYSTONE: light olive gray (5 Y 5/2) mottled with dark yellowish orange (10 YR 6/6); HCl reaction in the dark yellowish orange areas only; dry.</p> <p><u>21.0-23.0' SAMPLE.</u> Recovered 2.2/2.0' = 110%. 21.0-21.4': CLAYSTONE: same as above except some fine-grained sand and wet. 21.4-23.0': CLAYSTONE: light olive gray (5 Y 5/2); mottled with light yellowish orange; dry.</p> <p>Total depth of borehole measured 22.7'; adjust depth.</p> <p><u>22.7-23.7' SAMPLE.</u> Recovered 2.0/1.0' = 200%. CLAYSTONE: same as above.</p> <p><u>23.7-25.7' SAMPLE.</u> Recovered 2.0/2.0' = 100%. CLAYSTONE: same as above.</p> <p><u>25.7-27.7' SAMPLE.</u> Recovered 2.2/2.0' = 110%. CLAYSTONE: same as above, except a little less mottled.</p> <p>TOTAL DEPTH: 27.7'</p> | <p><u>15.0-16.9':</u> Direct hit sample: SP108715DH.</p> <p><u>17.0-19.0':</u> Direct hit sample: SP108717DH.</p> <p><u>17.0-19.0':</u> Duplicate sample: SP1087017D.</p> <p><u>19.0-21.0':</u> Direct hit sample: SP108719DH.</p> <p><u>21.0-23.0':</u> Water table sample: SP108721WT.</p> <p><u>22.7-23.7':</u> Direct hit sample: SP108723DH.</p> <p><u>23.7-25.7':</u> Direct hit sample: SP108724DH.</p> |
| 25 | | | | |
| 30 | | | | |
| 35 | | | | |
| 40 | | | | |

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Boring No.: SP11-87

Completed as well? No

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- ☐ Hydraulic Conductivity Test Data and Results
- ☐ Packer Test Data and Results
- ☐ Water Level Data
- ☐ Saturated Thickness Hydrographs

LOG OF BOREHOLE

Location Rocky Flats Plant; Solar Ponds Area

Coordinates * N 38590 E 21342

Total Depth 34.0'

Drilling Company Boyles Bros.

Date Drilled November 3-5, 1987

Drilling Method Hollow Stem Auger

Logged By R. Treat
Geologist

Borehole/Well No. SP11-87

Ground Surface Elevation *5904.5'

Water Level Encountered None

Static

Driller T. High

Helper B. Keeney

Drilling Fluid None

Checked By

Site Manager

CEARP Manager

Comments Borehole backfilled with Portland Type I Cement.

*Coordinates and elevation estimated from topographic map.

| Depth Feet | Graphic Log | Sample Type | Lithologic Description | Samples Collected or Other Tests Performed |
|---------------|----------------|----------------|--|---|
| 0 | | | ARTIFICIAL FILL/DISTURBED | |
| | | | <u>0.0-1.5' SAMPLE.</u> Recovered 1.5/1.5' = 100%. 0.0-0.3': SANDY CLAY: dusky brown (5 Y 2/2); low plastic; roots; fill; light moist. 0.3-1.5': CLAY: dark yellowish orange (10 YR 6/6); fine-grained sand with gravel to 3.2 mm; subrounded and rounded; low plastic; sandy; gravel; moderately oxide stained; light moist. | <u>0.0-1.5':</u> Field screen reading: HNu = 0.0(0.0); OVA = 0.0(0.0). |
| 5 | | | <u>1.5-3.5' SAMPLE.</u> Recovered 2.0/2.0' = 100%. CLAY: mixed brown and severely oxide stained; much noted claystone fragments and some sandstone particles; fine-grained sand; weakly cemented; fill; moist. | <u>1.5-3.5':</u> Field screen reading: HNu = 0.0(0.0); OVA = 0.0(0.0). |
| | | | <u>3.5-6.3' SAMPLE.</u> Recovered 3.2/2.8' = 114%. SANDY CLAYSTONE: mixed oxide stained brown; gravel; weakly cemented; low plastic; 1.75 mm fragment of asphalt noted at approximately 5.5'. | <u>3.5-6.3':</u> Field screen reading: HNu = 0.0(0.0); OVA = 0.0(0.0). |
| 10 | | | <u>6.3-8.8' SAMPLE.</u> Recovered 2.2/2.5' = 88%. CLAY: oxide stained brown to light gray and dark brown; claystone fragments; sandy to very sandy; fine-grained; weakly cemented; massive; very moist. | <u>0.0-8.5':</u> Composite sample: SP11870008. <u>6.3-8.5':</u> Field screen readings: HNu = 0.0(0.0); OVA = 0.0(0.0). |
| | | | <u>8.8-11.5' SAMPLE.</u> Recovered 2.5/2.7' = 93%. CLAY: brown to dusky brown (5 YR 2/2); claystone fragments; very much clay; few roots noted; slightly sandy; small and medium size scattered gravel; weakly cemented; low to medium plastic lenses; very moist. | <u>8.8-11.3':</u> Readings on core: HNu = 0; OVA = 13.5. <u>8.8-11.3':</u> Direct hit sample: SP118708DH. |
| 15 | | | <u>11.5-14.0' SAMPLE.</u> Recovered 2.5/2.5' = 100%. CLAY: dark gray (N 4/0) to dark gray (N 3/0); claystone fragments and clay with occasional gravel; varying gravel, rounded (1.75-2.50 mm); medium plastic; moderately to weakly cemented; moist to very moist at bottom. | <u>11.5-14.0':</u> Readings on core: HNu = 0; OVA = 95. <u>11.5-14.0':</u> Direct hit sample: SP118711DH. |
| 20 | | | | |

LOG OF BOREHOLE

Location Rocky Flats Plant; Solar Ponds Area

Coordinates _____

Total Depth _____

Drilling Company _____

Date Drilled _____

Drilling Method _____

Logged By _____

Geologist

Borehole/Well No. SP11-87(cont'd.)

Ground Surface Elevation _____

Water Level Encountered _____

Static _____

Driller _____

Helper _____

Drilling Fluid _____

Checked By _____

Site Manager

CEARP Manager

Comments _____

| Depth Feet | Graphic Log | Sample Type | Lithologic Description | Samples Collected or Other Tests Performed |
|---------------|----------------|----------------|---|---|
| 20 | | | <p><u>14.0-16.5' SAMPLE.</u> Recovered 1.1/2.5' = 44%. 14.0-14.5': CLAY: medium dark gray (N 4/0) to light gray (N 7/0) with some brown; claystone fragments; scattered gravel; slightly oxide stained; weakly cemented; highly plastic; moist.</p> <p><u>COLLUVIUM</u></p> <p>14.5-15.1': CLAY: grayish black (N 2/0) to brownish black (5 YR 2/2); scattered gravel; subrounded and subangular to 2.75 mm; slightly sandy; fine-grained; slightly organic; low plastic; moist.</p> <p><u>16.5-19.0' SAMPLE.</u> Recovered 1.3/2.5' = 52%. 16.5-17.0': CLAY: brownish black (5 YR 2/2); scattered gravel; same as above. 17.0-17.8': CLAY: moderate yellowish brown (10 YR 5/4) to grayish brown (5 YR 3/2); moderately cemented; medium plastic; slightly sandy and moist.</p> <p><u>19.0-21.5' SAMPLE.</u> Recovered 0.5/2.5' = 20%. CLAY: mixed brown and gray; medium plastic; moderately cemented; slightly sandy; very fine-grained; little scattered gravel; moist.</p> <p><u>ARAPAHOE FORMATION</u></p> <p><u>21.5-24.0' SAMPLE.</u> Recovered 2.5/2.5' = 100%. SANDSTONE: medium light gray (N 6/0) to medium dark gray (N 4/0); moderately oxide stained brown; low plastic; fine-grained sand (3.0-2.5 Ø); poorly sorted; somewhat blocky and moist.</p> <p><u>24.0-26.5' SAMPLE.</u> Recovered 2.5/2.5' = 100%. CLAYEY SANDSTONE: noted lignite fragments; gray as noted above; slightly to moderately oxide stained streaks; blocky; massive; low plastic; weakly cemented; fine-grained sand; moist.</p> | <p><u>14.0-15.1'</u>: Readings on core: HNu = 0; OVA = 95.</p> <p><u>14.0-15.1'</u>: Direct hit sample: SP118714DH.</p> <p><u>16.5-17.8'</u>: Readings on core: HNu = 0; OVA = 76.</p> <p><u>16.5-17.8'</u>: Direct hit sample: SP118716DH.</p> <p><u>19.0-19.5'</u>: Readings on core: HNu = 0; OVA = 310.</p> <p><u>19.0-19.5'</u>: Direct hit/upper contact sample: SP118719DH.</p> <p><u>21.5'</u>: Readings in augers: HNu = 0; OVA = 210.</p> <p><u>21.5-24.0'</u>: Readings on core: HNu = 1.5; OVA = 98.</p> <p><u>21.5-24.0'</u>: Direct hit/contact sample: SP118721DH.</p> <p><u>24.0-26.5'</u>: Readings on core: HNu = 0; OVA = 58.</p> <p><u>24.0-26.5'</u>: Direct hit/bedrock sample: SP118724DH.</p> |
| 25 | | | | |
| 30 | | | | |
| 35 | | | | |
| 40 | | | | |

LOG OF BOREHOLE

Location Rocky Flats Plant; Solar Ponds Area

Coordinates _____

Total Depth _____

Drilling Company _____

Date Drilled _____

Drilling Method _____

Logged By _____

Geologist

Borehole/Well No. SP11-87 (cont'd.)

Ground Surface Elevation _____

Water Level Encountered _____

Static _____

Driller _____

Helper _____

Drilling Fluid _____

Checked By _____

Site Manager

CEARP Manager

Comments _____

| Depth Feet | Graphic Log | Sample Type | Lithologic Description | Samples Collected or Other Tests Performed |
|---------------|----------------|----------------|---|---|
| | | | <p><u>26.5-29.0' SAMPLE.</u> Recovered 2.5/2.5' = 100%. CLAYEY SANDSTONE: medium dark gray (N 4/0) to dark gray (N 3/0); severely oxide stained brown streaks; low plastic; massive; somewhat blocky; moist.</p> <p><u>29.0-31.5' SAMPLE.</u> Recovered 2.5/2.5' = 100%. CLAYEY SANDSTONE: medium dark gray (N 4/0) with slight oxide staining; lignite particles scattered about; fine-grained sand (3.0-2.5 Ø); low plastic; massive; weakly to moderately cemented; moist.</p> <p><u>31.5-34.0' SAMPLE.</u> Recovered 2.5/2.5' = 100%. SANDSTONE/CLAYSTONE INTERBED-DED: dark gray (N 3/0) varying to medium gray (N 5/0) with slight to moderate oxide stained lenses of light brown (5 YR 5/6); fine-grained sand (3.0-2.5 Ø); massive claystone; low to medium plastic; blocky; poorly sorted sand; moist to light moist at bottom.</p> <p>TOTAL DEPTH: 34.0'</p> | <p><u>26.5-29.0'</u>: Readings on core: HNu = 0; OVA = 38.</p> <p><u>26.5-29.0'</u>: Direct hit sample: SP118726DH.</p> <p><u>29.0'</u>: Readings in augers: HNu = 0; OVA = 220.</p> <p><u>29.0-31.5'</u>: Direct hit sample: SP118729DH.</p> <p><u>29.0-31.5'</u>: Readings in core: HNu = 0; OVA = 11.5.</p> <p><u>31.5-34.0'</u>: Field screen readings: HNu = 0(0); OVA = 0(0).</p> |

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- ☐ Packer Test Data and Results
- ☐ Water Level Data
- ☐ Saturated Thickness Hydrographs

LOG OF BOREHOLE

Location Rocky Flats Plant; Solar Ponds Area

Coordinates * N 38635 E 21855

Total Depth 46.5'

Borehole/Well No. SP12-87

Ground Surface Elevation *5893.0'

Water Level Encountered 39.0'

Static

Drilling Company Boyles Bros.

Date Drilled November 9-11, 1987

Drilling Method Hollow Stem Auger

Logged By R. Treat

Geologist

Driller T. High

Helper B. Keeney

Drilling Fluid None

Checked By

Site Manager

CEARP Manager

Comments Borehole backfilled with Portland Type I Cement.

*Coordinates and elevation estimated from topographic map.

| Depth Feet | Graphic Log | Sample Type | Lithologic Description | Samples Collected or Other Tests Performed |
|---------------|----------------|----------------|--|--|
| 0 | | | ARTIFICIAL FILL/DISTURBED | |
| | | | 0.0-1.5' SAMPLE. Recovered 1.0/1.5' = 67%. SANDY CLAY: moderate yellowish brown (10 YR 5/4) to dark yellowish orange (10 YR 6/6); fine-grained sand (2.5-2.0 ϕ); poorly sorted; weakly cemented; moist. | HNU Background=0.0 OVA Background=0.2 Ludlum Background = 0.0 |
| | | | 1.5-3.5' SAMPLE. Recovered 2.0/2.0' = 100%. 1.5-2.0': CLAY: moderate brown (5 YR 4/4); slightly sandy; some small-size scattered gravel; rounded; moderately cemented; moist. 2.0-3.5': CLAY: medium gray (N 5/0) to varying brown of moderate yellowish brown (10 YR 5/4); fine-grained sand; weakly cemented; low plastic; fill; moist. | 0.0-1.0': Field screen readings: HNU = 0.0(0.0); OVA = 0.0(0.0). 1.5-3.5': Field screen readings: HNU = 0.0(0.0); OVA = 0.0(0.0). |
| 5 | | | 3.5-6.5' SAMPLE. Recovered 3.0/3.0' = 100%. 3.5-4.5': CLAY: light brown (5 YR 5/6); sandy and scattered gravel; moderately cemented; fine- and medium-grained sand (1.5-1.0 ϕ to 0.5-0.0 ϕ); gravel ranging 1.50 mm; rounded; low plastic; moist. 4.5-6.5': CLAY: medium gray (N 5/0); low plastic; sandy (3.0-2.5 ϕ); weakly cemented; some thin clay pockets; poorly sorted sand; slightly oxide stained; weathered; claystone fragments; moist. | 3.5-6.5': Field screen readings: HNU = 0.0(0.0); OVA = 0.0(0.0). 0.0-9.0': Composite sample: SP12870009. |
| 10 | | | 6.5-9.0' SAMPLE. Recovered 2.5/2.5' = 100%. SAND AND CLAY: very pale orange (10 YR 8/2) to medium light gray (N 6/0) and medium gray (N 5/0); blotchy; weakly cemented; low plastic; moist. | 6.5-9.0': Field screen readings: HNU = 0.0(0.0); OVA = 0.0(0.0). 9.0-11.5': Field screen readings: HNU = 0.0(0.0); OVA = 0.0(0.0). |
| 15 | | | 9.0-11.5' SAMPLE. Recovered 2.5/2.5' = 100%. CLAY AND SAND: moderate yellowish brown (10 YR 5/4) to dark gray (N 3/0) to medium light gray (N 6/0); noted 0.4' lense of clayey sand at approximately 10.8-11.2' with gravel; low plastic; weakly cemented; fine- and medium-grained sand lenses; moist. | 11.5-14.0': Field screen readings: HNU = 0.0(0.0); OVA = 0.0(0.0). 14.0-16.5': Field screen readings: HNU = 0.0(0.0); OVA = 0.0(0.2). 9.0-16.5': Composite sample: SP12870916. |
| 20 | | | | |

LOG OF BOREHOLE

Location Rocky Flats Plant: Solar Ponds Area Borehole/Well No. SP12-87(cont'd.)

Coordinates _____ Ground Surface Elevation _____

Total Depth _____ Water Level Encountered _____

Static _____

Drilling Company _____ Driller _____

Date Drilled _____ Helper _____

Drilling Method _____ Drilling Fluid _____

Logged By _____ Checked By _____

Geologist Site Manager

CEARP Manager

Comments _____

| Depth Feet | Graphic Log | Sample Type | Lithologic Description | Samples Collected or Other Tests Performed |
|---------------|----------------|----------------|--|--|
| 20 | | | <p><u>11.5-14.0' SAMPLE.</u> Recovered 2.5/2.5' = 100%. CLAY: grayish brown (5 YR 3/2) to dark yellowish brown (10 YR 5/4); small (1.50 mm) gravel; rounded; claystone fragments medium dark gray (M 4/0); low plastic; weakly to moderately cemented; scattered gravels and claystone; moist.</p> | |
| 25 | | | <p><u>14.0-16.5' SAMPLE.</u> Recovered 3.2/2.5' = 128%. CLAY: some claystone lenses; as noted above for colors with small and medium scattered gravel (1.25 mm to 3.4 mm); rounded, subrounded, and subangular; slightly sandy; moderate to low plasticity; few scattered roots noted; moist.</p> | |
| | | | <p><u>16.5-19.0' SAMPLE.</u> Recovered 2.5/2.5' = 100%. CLAY: mixed brown to varying gray; with claystone fragments; scattered gravel; slightly to moderately oxide stained; medium to low plastic; slightly sandy to sandy lenses; fine- and medium-grained; moist.</p> | <p><u>16.5-19.0':</u> Readings on core: HNu = 0; OVA = 6.8.</p> |
| 30 | | | <p><u>19.0-21.5' SAMPLE.</u> Recovered 2.5/2.5' = 100%. CLAY: multi-colored brown and gray; with some claystone fragments; noted organic lense at 21.0-21.4'; dusky brown (5 YR 2/2); numerous roots; low to medium plastic; weakly cemented; light moist to moist.</p> | <p><u>16.5-19.0':</u> Direct hit sample: SP128716DH.</p> <p><u>19.0-21.5':</u> Readings on core: HNu = 6.8; OVA = 132.</p> |
| 35 | | | <p><u>21.5-24.0' SAMPLE.</u> Recovered 2.5/2.5' = 100%. 21.5-21.8': CLAY: varying brown; medium- and large-size gravel (3.50 mm); moist.</p> | <p><u>19.0-21.5':</u> Direct hit sample: SP128719DH.</p> |
| | | | <p style="text-align: center;"><u>COLLUVIUM</u></p> | <p><u>21.5-24.0':</u> Readings on core: HNu = 0; OVA = 76.</p> |
| | | | <p>21.8-24.0': CLAY: dusky brown (5 YR 2/2) to brownish black (5 YR 2/2); scattered gravel (1.50 mm); rounded and subrounded; much roots noted; low plastic; sand (3.5-3.0 Ø); light moist to moist.</p> | <p><u>21.5-24.0':</u> Direct hit sample: SP128721DH.</p> |
| 40 | | | | |

LOG OF BOREHOLE

Location Rocky Flats Plant; Solar Ponds Area Borehole/Well No. SP12-87(cont'd.)
 Coordinates _____ Ground Surface Elevation _____
 Total Depth _____ Water Level Encountered _____
 Static _____
 Drilling Company _____ Driller _____
 Date Drilled _____ Helper _____
 Drilling Method _____ Drilling Fluid _____
 Logged By _____ Checked By _____
 Geologist _____ Site Manager _____
 CEARP Manager _____

Comments _____

| Depth Feet | Graphic Log | Sample Type | Lithologic Description | Samples Collected or Other Tests Performed |
|---------------|----------------|----------------|---|--|
| 40 | | | <p><u>24.0-26.5' SAMPLE.</u> Recovered 1.2/2.5' = 48%. SAND: moderate yellowish brown (10 YR 5/4) to light brown (5 YR 5/6) and little dark yellowish orange (10 YR 6/6); slightly clayey to very clayey with gravel; well sorted sand ranging (2.0-1.5 ϕ to 0.5-1.0 ϕ); subrounded; rounded; and few subangular gravels ranging 1.25 mm to 3.75 mm and larger; weakly cemented; light moist.</p> | <p><u>24.0-25.2'</u>: Readings on core: HNU = 0; OVA = 124. <u>24.0-25.2'</u>: Direct hit sample: SP128724DH.</p> |
| 45 | | | <p><u>26.5-29.0' SAMPLE.</u> Recovered 0.8/2.5' = 32%. CLAY: varying brown to medium gray (N 5/0); slightly sandy with small scattered gravels; medium plastic; slightly calcareous; moderately plastic; moist.</p> | <p><u>26.5-27.3'</u>: Readings on core: HNU = 0.0; OVA = 125. <u>26.5-27.3'</u>: Direct hit/upper contact sample: SP128726DH.</p> |
| | | | <p><u>29.0-31.5' SAMPLE.</u> Recovered 2.5/2.5' = 100%. 29.0-29.7': SANDY CLAY: pale brown (5 YR 5/2) to moderate yellowish brown (10 YR 5/4); slightly oxide stained; fine-grained sand (3.0-2.5 ϕ); weakly cemented; low plastic; light moist.</p> | <p><u>29.0-31.5'</u>: Readings on core: HNU = 0; OVA = 38. <u>29.0-31.5'</u>: Direct hit/contact sample: SP128729DH.</p> |
| 50 | | | <p><u>ARAPAHOE FORMATION</u></p> <p>29.7-31.5': SANDY CLAYSTONE: medium light gray (N 6/0) to medium dark gray (N 4/0); fine-grained sand (3.5-3.0 ϕ); massive; blocky; low plastic; weakly to somewhat moderately cemented; weathered; moist.</p> | <p><u>31.5-32.2'</u>: Readings on core: HNU = 0; OVA = 72. <u>31.5-32.2'</u>: Direct hit/bedrock sample: SP128731DH.</p> |
| | | | <p><u>31.5-34.0' SAMPLE.</u> Recovered 0.7/2.5' = 28%. CLAYSTONE: medium gray (N 5/0) to dark gray (N 3/0); medium plastic; slightly oxide stained; massive; slightly sandy; weathered; moist.</p> | <p><u>34.0-34.5'</u>: Readings on core: HNU = 0; OVA = 78. <u>34.0-34.5'</u>: Direct hit sample: SP128734DH.</p> |
| 55 | | | <p><u>34.0-36.5' SAMPLE.</u> Recovered 0.5/2.5' = 20%. SANDY CLAYSTONE: same as above.</p> | <p><u>39.0-41.0'</u>: Readings on core: HNU = 0; OVA = 22.</p> |
| | | | <p><u>36.5-39.0' SAMPLE.</u> Recovered 0.0/2.5' = 0%.</p> | |
| 60 | | | | |

LOG OF BOREHOLE

Location Rocky Flats Plant; Solar Ponds Area

Borehole/Well No. SP12-87 (cont'd.)

Coordinates _____

Ground Surface Elevation _____

Total Depth _____

Water Level Encountered _____

Static _____

Drilling Company _____

Driller _____

Date Drilled _____

Helper _____

Drilling Method _____

Drilling Fluid _____

Logged By _____

Checked By _____

Geologist

Site Manager

CEARP Manager

Comments _____

| Depth Feet | Graphic Log | Sample Type | Lithologic Description | Samples Collected or Other Tests Performed |
|---------------|----------------|----------------|---|--|
| | | | <p><u>39.0-41.0' SAMPLE.</u> Recovered 2.0/2.0' = 100%. SANDSTONE: medium dark gray (N 4/0) to dark gray (N 3/0); slightly oxide streaked; much lignite influence; fine-grained sand (3.0-2.5 ϕ); weakly cemented; weathered; light moist.</p> | <p><u>39.0-41.0'</u>: Direct hit sample: SP128739DH.</p> |
| | | | <p><u>41.5-44.0' SAMPLE.</u> Recovered 2.5/2.5' = 100%. SANDSTONE: varying pale brown (5 YR 5/2) to grayish brown (5 YR 3/2) to dark gray (N 3/0); now only moderately influenced with lignite seams; slightly oxide stained; fine-grained sand; weakly to moderately cemented; weathered; light moist.</p> | <p><u>41.5-44.0'</u>: Readings on core: HNu = 0; OVA = 8.8.</p> <p><u>41.5-44.0'</u>: Direct hit sample: SP128741DH.</p> |
| | | | <p><u>44.0-46.5' SAMPLE.</u> Recovered 2.5/2.5' = 100%. SANDSTONE: clayey pale brown (5 YR 5/2) to grayish brown (5 YR 3/2); weakly to moderately cemented; fine-grained sand (3.5-3.0 ϕ and 3.0-2.5 ϕ); poorly sorted; weathered; light moist.</p> | <p><u>44.0-46.5'</u>: Readings on core: HNu = 0; OVA = 0.</p> <p><u>44.0-46.5'</u>: Field screen readings: HNu = 0.0(0.0); OVA = 0.0(0.0).</p> |
| | | | TOTAL DEPTH: 46.5' | |

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Completed as well? No

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- ☐ Hydraulic Conductivity Test Data and Results
- ☐ Packer Test Data and Results
- ☐ Water Level Data
- ☐ Saturated Thickness Hydrographs

LOG OF BOREHOLE

Location Rocky Flats Plant; Solar Ponds Area

Coordinates * N 38350 E 22120

Total Depth 16.5'

Drilling Company Boyles Bros.

Date Drilled November 6, 1987

Drilling Method Hollow Stem Auger

Logged By R. Treat
Geologist

Borehole/Well No. SP13-87

Ground Surface Elevation *5925.0'

Water Level Encountered None

Static

Driller T. High

Helper B. Keeney

Drilling Fluid None

Checked By _____
Site Manager

CEARP Manager

Comments Borehole backfilled with Portland Type I Cement.

*Coordinates and elevation estimated from topographic map.

| Depth Feet | Graphic Log | Sample Type | Lithologic Description | Samples Collected or Other Tests Performed |
|---------------|----------------|----------------|--|---|
| 0 | | | <u>ARTIFICIAL FILL/DISTURBED</u> | |
| | | | 0.0-1.5' SAMPLE. Recovered 1.5/1.5' = 100%. 0.0-1.3': SAND grayish orange (10 YR 7/4); silty and slightly clayey; fine-grained sand (3.5- 3.0 Ø); weakly cemented; poorly sorted with upper 0.2' organic with many roots noted; light moist. | |
| | | | <u>ROCKY FLATS ALLUVIUM</u> | |
| — 5 | | | 1.3-1.5': CLAY: grayish brown (5 YR 3/2); moderately cemented; medium plastic; some scattered gravel; lightly moist. | |
| | | | 1.5-3.5' SAMPLE. Recovered 2.0/2.0' = 100%. 1.5-2.7': CLAY: grayish brown (5 YR 3/2); moderately to highly cemented; medium plastic; slightly sandy; very fine-grained; moist. | |
| | | | <u>ARAPAHOE FORMATION</u> | |
| — 10 | | | 2.7-3.5': SANDY CLAYSTONE: medium light gray (N 6/0); low plastic; massive; blocky; fine-grained sand (3.5-3.0 Ø); weathered; moist. | |
| | | | 3.5-6.5' SAMPLE. Recovered 3.0/3.0' = 100%. SANDY CLAYSTONE: medium dark gray (N 4/0); fine- grained sand (3.5-3.0 Ø); massive; just slightly oxide stained; blocky; medium plastic; moderately cemented; weathered; moist. | |
| — 15 | | | 6.5-9.0' SAMPLE. Recovered 2.5/2.5' = 100%. CLAYSTONE: sandy to very sandy as noted in previous run; medium to low plastic; weakly cemented; slightly to moderately oxide stained; weathered; moist. | |
| | | | 9.0-11.5' SAMPLE. Recovered 2.5/2.5' = 100%. 9.0-9.2': SANDY CLAYSTONE: as noted above. 9.2-11.5': CLAYEY SANDSTONE: medium light gray (N 6/0) to moderately and severely oxide stained brown of dark yellowish orange (10 YR 6/6) to moderate yellowish brown (10 YR 5/4); weakly to moderately cemented; fine-grained sand (3.0-2.5 Ø); poorly sorted; weathered; moist. | |
| — 20 | | | | |

LOG OF BOREHOLE

Location Rocky Flats Plant: Solar Ponds Area Borehole/Well No. SP13-87 (cont'd.)
 Coordinates _____ Ground Surface Elevation _____
 Total Depth _____ Water Level Encountered _____
 Static _____
 Drilling Company _____ Driller _____
 Date Drilled _____ Helper _____
 Drilling Method _____ Drilling Fluid _____
 Logged By _____ Checked By _____
 Geologist _____ Site Manager _____
 CEARP Manager _____

Comments _____

| Depth Feet | Graphic Log | Sample Type | Lithologic Description | Samples Collected or Other Tests Performed |
|---------------|----------------|----------------|--|--|
| | | | <p><u>11.5-14.0' SAMPLE.</u> Recovered 2.5/2.5' = 100%. 11.5-13.5': SANDSTONE: clayey to very clayey lenses; color as stated above; fine-grained sand (3.0-2.5 Ø); weakly cemented; moderately oxide stained; moist; 13.5-14.0': CLAYSTONE: medium dark gray (N 4/0); slightly sandy; massive; medium plastic; blocky; fine-grained sand; poorly sorted; weathered; light moist.</p> <p><u>14.0-16.5' SAMPLE.</u> Recovered 2.5/2.5' = 100%. CLAYSTONE: medium gray (N 5/0) to medium dark gray (N 4/0); slightly sandy to sandy lensed; only slight oxide staining apparent; pale yellowish orange (10 YR 8/6); blocky; massive; weathered; moist.</p> <p>TOTAL DEPTH: 16.5'</p> | <p><u>11.5-14.0'</u>: Direct hit sample: SP138711DH.</p> <p><u>14.2'</u>: Readings in augers: HNu = 14.2' OVA = 0.0.</p> <p><u>14.0-16.5'</u>: Field screen readings: HNu = 0.0(0.0); OVA = 0.0(0.0).</p> |

INDEX OF DATA

Boring No.: SP14-87

Completed as well? No

Data in File

- ☒ Log of Borehole
- ☐ Well Construction Summaries
- ☐ Well Development Summaries
- ☐ Hydraulic Conductivity Test Data and Results
- ☐ Packer Test Data and Results
- ☐ Water Level Data
- ☐ Saturated Thickness Hydrographs

LOG
OF
BOREHOLE

Location Rocky Flats Plant; Solar Ponds Area
Coordinates * N 38622 E 22328
Total Depth 7.0'

Borehole/Well No. SP14-87
Ground Surface Elevation *5890.0'
Water Level Encountered None
Static _____

Drilling Company Bovles Bros.
Date Drilled November 11 and 12, 1987
Drilling Method Hollow Stem Auger
Logged By R. Treat
Geologist

Driller T. High
 Helper B. Keeney
 Drilling Fluid None
 Checked By Site Manager

CEARP Manager

Comments Borehole backfilled with Portland Type I Cement.
*Coordinates and elevation estimated from topographic map.

| Depth Feet | Graphic Log | Sample Type | Lithologic Description | Samples Collected or Other Tests Performed |
|---------------|----------------|----------------|---|---|
| 0 | | | <u>ARTIFICIAL FILL/DISTURBED</u> | |
| | | | <u>0.0-2.0' SAMPLE.</u> Recovered 0.4/2.0' = 20%. CLAY: dusky brown (5 YR 2/2); slightly sandy with gravel; low plastic; weakly cemented; moist; very organic in upper 0.4'; with roots. | |
| | | | <u>2.0-4.0' SAMPLE.</u> Recovered 2.0/2.0' = 100%. 2.0-3.2': CLAY: dark yellowish orange (10 YR 6/6) to moderate yellowish brown (10 YR 5/4); low to medium plastic; scattered gravel; moderately cemented; moist. | HNu Background=1.1 OVA Background=0.0 Ludlum Background = 0.0 |
| 5 | | | <u>ARAPAHOE FORMATION</u> | <u>0.0-0.4':</u> Upper contact sample: SP148700UC (VOAs only). |
| | | | 3.2-4.0': CLAYSTONE AND SANDSTONE: medium dark gray (N 4/0) to dark gray (N 3/0); weakly cemented; poorly sorted; fine-grained sand (3.0-2.5 Ø); low plastic; weathered; light moist. | <u>0.0-0.4':</u> Field screen readings: HNu = 0.0(0.0); OVA = 0.0(0.0). |
| | | | <u>4.0-7.0' SAMPLE.</u> Recovered 3.0/3.0' = 100%. SANDY CLAYSTONE: medium dark gray (N 4/0); medium plastic; blocky; slightly oxide stained; streaked and slightly calcareous lensed; massive; fine-grained sand (3.5-3.0 Ø); weakly to moderately cemented; weathered; moist. | <u>2.0-4.0':</u> Contact sample: SP148702CT. |
| 10 | | | | <u>4.0-7.0':</u> Bedrock sample taken: SP148704BR. |
| | | | TOTAL DEPTH: 7.0' | |
| 15 | | | | |
| 20 | | | | |

INDEX OF DATA

Boring No.: SP15-87

Completed as well? No

Data in File

- ☒ Log of Borehole
- ☐ Well Construction Summaries
- ☐ Well Development Summaries
- ☐ Hydraulic Conductivity Test Data and Results
- ☐ Packer Test Data and Results
- ☐ Water Level Data
- ☐ Saturated Thickness Hydrographs

LOG OF BOREHOLE

Location Rocky Flats Plant; Solar Ponds Area

Coordinates * N 38273 E 22674

Total Depth 19.5'

Borehole/Well No. SP15-87

Ground Surface Elevation *5927.0'

Water Level Encountered 12.3'

Static

Drilling Company Boyles Bros.

Driller T. High

Date Drilled November 12 and 13, 1987

Helper B. Keeney

Drilling Method Hollow Stem Auger

Drilling Fluid None

Logged By R. Treat

Checked By

Geologist

Site Manager

CEARP Manager

Comments Borehole backfilled with Portland Type I Cement.

*Coordinates and elevation estimated from topographic map.

| Depth Feet | Graphic Log | Sample Type | Lithologic Description | Samples Collected or Other Tests Performed |
|---------------|----------------|----------------|---|--|
| 0 | | | ARTIFICIAL FILL/DISTURBED | |
| | | | <u>0.0-2.0' SAMPLE.</u> Recovered 1.5/2.0' = 75%. CLAY: dark yellowish orange (10 YR 6/6) to moderate brown (5 YR 4/4) and light brown (5 YR 5/6) to medium gray (N 5/0); claystone pieces; sandy with scattered gravel; rounded and subrounded; quartzite composition; low plastic; weakly cemented; light moist to moist lensed. | HNu Background=0.0 OVA Background=0.0 Ludlum Background = 0.0 0.0-1.5': Field screen readings: HNu = 0.0(0.0); OVA = 2.2(2.7). |
| 5 | | | <u>2.0-4.0' SAMPLE.</u> Recovered 0.8/2.0' = 40%. CLAY: with claystone and sandstone; colors varying as stated above with scattered gravel; weakly cemented; fine-grained sand; light moist. | 2.0-2.8': Direct hit sample: SP158702DH. 2.0-2.8': Readings on core: HNu = 0; OVA = 12.5. |
| | | | <u>4.0-7.0' SAMPLE.</u> Recovered 0.4/3.0' = 13%. CLAY: with claystone and some scattered gravel; multi-colored brown to gray; low plastic; weakly cemented; subrounded and rounded gravel; light moist. | 4.0-4.4': Readings on core: HNu = 0; OVA = 4.85. |
| 10 | | | <u>7.0-8.0':</u> No recovery. Drilled with center bit. | 4.0-4.4': Direct hit sample: SP158704DH (VOAs only). |
| | | | <u>8.0-10.0' SAMPLE.</u> Recovered 2.0/2.0' = 100%. CLAY: light brown (5 YR 6/4) to moderate yellowish brown (10 YR 5/4) and grayish brown (5 YR 3/2); slightly sandy to very sandy lensed; fine-grained sand (3.5-3.0 ϕ); weakly to moderately cemented; low to medium plastic; scattered gravel to 2.75 mm; rounded; soil very organic in composition and smell; moist. | 8.0-10.0': Readings on core: HNu = 0; OVA = 44. 8.0-10.0': Direct hit sample: SP158708DH. 8.0-10.0': Duplicate sample: SP1587008D. |
| | | | ROCKY FLATS ALLUVIUM | 10.0-12.0': Readings on core: HNu = 0; OVA = 28. |
| 15 | | | <u>10.0-12.0' SAMPLE.</u> Recovered 2.0/2.0' = 100%. 10.0-10.5': CLAYEY SAND: light brown (5 YR 5/6); scattered gravel; fine-grained sand (2.5-2.0 ϕ to 2.0-1.5 ϕ); rounded gravel; weakly cemented; moist. 10.5-11.5': CLAY: light gray (N 7/0) to light olive gray (5 Y 5/2) and pale brown (5 YR 5/2); slightly organic; moderately cemented; moist. 11.5-12.0': CLAY: very sandy; moderate brown (5 YR 4/4) to moderate yellowish brown (10 YR 5/4); fine-grained sand (3.5-3.0 ϕ); moderately cemented; low plastic; moist. | 10.0-12.0': Direct hit sample: SP158710DH. 12.0': Readings in augers: HNu = 0; OVA = 2.2 |
| 20 | | | | |

LOG OF BOREHOLE

Location Rocky Flats Plant; Solar Ponds Area

Coordinates _____

Total Depth _____

Drilling Company _____

Date Drilled _____

Drilling Method _____

Logged By _____

Geologist

Borehole/Well No. SP15-87 (cont'd.)

Ground Surface Elevation _____

Water Level Encountered _____

Static _____

Driller _____

Helper _____

Drilling Fluid _____

Checked By _____

Site Manager

CEARP Manager

Comments _____

| Depth Feet | Graphic Log | Sample Type | Lithologic Description | Samples Collected or Other Tests Performed |
|---------------|----------------|----------------|--|--|
| | | | <p><u>12.0-14.5' SAMPLE.</u> Recovered 2.5/2.5' = 100%. SAND: moderate yellowish brown (10 YR 5/4) to dark yellowish orange (10 YR 6/6) to light gray (N 7/0) and medium gray (N 5/0), streaked; slightly clayey to very clayey; sand (2.5-2.0 Ø); weakly cemented; wet approximately 12.0-12.3', then very moist.</p> | <p><u>12.0-14.5':</u> Readings on core: HNU = 0; OVA = 2.2.</p> <p><u>12.0-14.5':</u> Water table; upper contact; direct hit sample: SP158712WT.</p> |
| | | | <p><u>14.5-17.0' SAMPLE.</u> Recovered 2.5/2.5' = 100%. 14.5-14.9': SAND: very clayey as noted in previous run.</p> | |
| | | | <p><u>ARAPAHOE FORMATION</u></p> | |
| | | | <p>14.9-17.0': SANDY CLAYSTONE: light brown (5 YR 5/6) to predominantly medium light gray (N 6/0); weathered; moderately oxide stained; medium plastic; massive; fine-grained sand (3.5-3.0 Ø); blocky; weakly to moderately cemented; moist.</p> | <p><u>14.5-17.0':</u> Contact sample: SP158714CT.</p> |
| | | | <p><u>17.0-19.5' SAMPLE.</u> Recovered 2.5/2.5' = 100%. CLAYSTONE: medium light gray (N 6/0) to medium dark gray (N 4/0); weathered; sandy (3.5-3.0 Ø); blocky; massive; medium plastic; moderately cemented; moist.</p> | <p><u>17.0-19.5':</u> Bedrock sample: SP158717BR.</p> |
| | | | <p>TOTAL DEPTH: 19.5'</p> | |

INDEX OF DATA

Boring No.: 56-87/SP16-87

Completed as well? Yes

Data in File

- ☒ Log of Borehole
- ☒ Well Construction Summaries
- ☒ Well Development Summaries
- ☐ Hydraulic Conductivity Test Data and Results
- ☐ Packer Test Data and Results
- ☒ Water Level Data
- ☐ Saturated Thickness Hydrographs

LOG OF BOREHOLE

Location Rocky Flats Plant; Solar Pond Area
Coordinates N 37654.23 E 21319.10
Total Depth 13.40'

Borehole/Well No. 56-87/SP16-87
Ground Surface Elevation 5978.51'
Water Level Encountered None

Drilling Company Boyles Bros.
Date Drilled January 7, 1988
Drilling Method Hollow Stem Auger
Logged By KD Holliway
Geologist

Static _____
Driller T. High
Helper B. Keeney
Drilling Fluid None
Checked By _____

Site Manager

CEARP Manager

Comments _____

| Depth Feet | Graphic Log | Sample Type | Lithologic Description | Samples Collected or Other Tests Performed |
|---------------|----------------|----------------|---|---|
| 0 | | | <u>TOP SOIL</u> | |
| | | | <u>0.0-2.0' SAMPLE.</u> Recovered 2.0/2.0' = 100%. | HNu background=1.2. OVA Background=1.6 Ludlum background = 0.0 |
| | | | 0.0-0.5': TOP SOIL: varied greens and browns; grass and ice; subangular; cobbles up to 1" diameter; sandy clay; frozen. | 0.0-2.0': Field screen readings: HNu = 1.2 (1.2); OVA = 1.9 (1.2). |
| 5 | | | <u>ARTIFICIAL FILL/DISTURBED</u> | 0.0-2.0': Field screen sample: SP168702FS. |
| | | | 0.5-1.1': CLAYEY SAND: pale yellowish brown (10 YR 6/2) to dark yellowish brown (10 YR 4/2); very coarse-grained (2.0-1.5 Ø to 1/4"), poorly sorted sand; subrounded to angular; small quartzite gravel up to 1" diameter; unconsolidated; moist to frozen. | 2.0-3.5': Field screen readings: HNu = 1.2 (1.2); OVA = 1.2 (1.2). |
| 10 | | | 1.1-2.0': SANDY CLAY: moderate brown (5 YR 3/4); some very coarse-grained, poorly sorted, subrounded to angular sand; angular quartzite gravel up to 3" diameter; varied green to yellow red orange to red staining throughout core; damp. | 4.0-6.0': Field screen readings: HNu = 1.6 (1.6); OVA = 1.2 (1.2). |
| 15 | | | | 6.0-8.0': Field screen readings: HNu = 1.2 (1.2); OVA = 1.0 (1.0). |
| | | | | 6.0-8.0': Upper con- tact sample: SP168708UC. |
| | | | | 10.0-11.2': Contact sample: SP168710CT |
| 20 | | | | 11.2-13.4': Field screen readings: HNu = 1.2 (1.2); OVA = 1.0 (1.0). |

LOG OF BOREHOLE

Location Rocky Flats Plant; Solar Pond Area
Coordinates N 37654.23 E 21319.10
Total Depth 13.40'

Borehole/Well No. 56-87/SP16-87 (cont'd)
Ground Surface Elevation 5978.51'
Water Level Encountered None

Drilling Company Boyles Bros.
Date Drilled January 7, 1988
Drilling Method Hollow Stem Auger
Logged By KD Holliday
Geologist

Static _____
Driller T. High
Helper B. Keeney
Drilling Fluid None
Checked By _____

Site Manager

CEARP Manager

Comments _____

| Depth Feet | Graphic Log | Sample Type | Lithologic Description | Samples Collected or Other Tests Performed |
|---------------|----------------|----------------|--|--|
| | | | <p><u>2.0-4.0' SAMPLE.</u> Recovered 1.5/2.0' = 75%. CLAYEY SAND AND GRAVEL: light brown (5 YR 5/6) with pale yellowish orange (10 YR 8/6) and dark yellowish orange (10 YR 6/6) with trace moderate reddish brown (10 YR 4/6), mostly in sand zones; very coarse-grained, poorly sorted sand, subangular to angular; quartzite gravel subangular to broken, to 3" diameter; becomes sandier down core with medium-grained (2.5-1.5 Ø) fairly sorted, subangular sand; damp.</p> <p><u>4.0-6.0' SAMPLE.</u> Recovered 2.0/2.0' = 100%. SANDY CLAY: moderate yellowish brown (10 YR 5/4) to dark yellowish brown (10 YR 4/2) with some yellowish gray (5 Y 7/2) especially towards bottom of core; subangular to angular quartzite gravel up to 2" diameter increases down core; quartzitic sand and pebbles, sub-rounded to subangular medium-grained (2.0-1.5 Ø) to coarse-grained up to 1/4" diameter; poorly sorted; unconsolidated; some caliche increases down core; damp to moist.</p> | <p><u>11.2-13.4': Bedrock</u> Sample: SP168711BR</p> |

LOG
OF
BOREHOLE

Location Rocky Flats Plant; Solar Pond Area
 Coordinates N 37654.23 E 21319.10
 Total Depth 13.40'

Borehole/Well No. 56-87/SP16-87 (cont'd)
 Ground Surface Elevation 5978.51'
 Water Level Encountered None

Static _____

Drilling Company Boyles Bros.
 Date Drilled January 7, 1988
 Drilling Method Hollow Stem Auger
 Logged By KD Holliday
 Geologist

Driller T. High
 Helper B. Keeney
 Drilling Fluid None
 Checked By _____
 Site Manager
 CEARP Manager

Comments _____

| Depth Feet | Graphic Log | Sample Type | Lithologic Description | Samples Collected or Other Tests Performed |
|---------------|----------------|----------------|---|---|
| | | | <u>6.0-8.0' SAMPLE.</u> Recovered 2.0/2.0' = 100%. 6.0-6.3': GRAVEL: angular to broken; some fine-grained sand; dry. 6.3-7.0': CLAYEY SAND: dusky yellow (5 Y 6/4) to yellowish gray (5 Y 7/2); some clay; sand is very fine-grained to fine-grained (2.5-2.0 Ø); fairly well sorted; unconsolidated; some caliche (strong reaction to HCl); damp to moist. 7.00-8.00': CLAYEY SAND AND GRAVEL: yellowish gray (5 Y 7/2) with light brown (5 YR 5/6) and moderate reddish brown (10 R 4/6) staining; fine-grained (2.5-2.0 Ø) to coarse-grained, poorly sorted, subrounded to subangular sand; subangular gravel; lots of caliche; unconsolidated; moist. | |
| | | | <u>8.0-10.0' SAMPLE.</u> Recovered 0.0/2.0' = 0%. Lost core. | |
| | | | <u>ARAPAHOE FORMATION</u> | |
| | | | Q/Ka contact estimated at 9.40' by drilling and cuttings. | |
| | | | <u>10.0-11.2' SAMPLE.</u> Recovered 1.8/1.2' = 150%. SANDY CLAYSTONE: light olive gray (5 Y 5/2) to yellowish gray (5 Y 7/2) with dark yellowish orange (10 YR 6/6) iron staining; very fine-grained to fine-grained sand; some caliche; consolidated; damp. | |

LOG
OF
BOREHOLE

Location Rocky Flats Plant; Solar Pond Area
Coordinates N 37654.23 E 21319.10
Total Depth 13.40'

Borehole/Well No. 56-87/SP16-87 (cont'd)
Ground Surface Elevation 5978.51'
Water Level Encountered None

Drilling Company Boyles Bros.
Date Drilled January 7, 1988
Drilling Method Hollow Stem Auger
Logged By KD Holliday
Geologist

Static _____
Driller T. High
Helper B. Keeney
Drilling Fluid None
Checked By _____
Site Manager _____
CEARP Manager _____

Comments _____

| Depth Foot | Graphic Log | Sample Type | Lithologic Description | Samples Collected or Other Tests Performed |
|---------------|----------------|----------------|---|---|
| | | | <p><u>11.2-13.4' SAMPLE.</u> Recovered 2.2/2.2' = 100%. SANDY CLAYSTONE: same as above with occasional iron nodules.</p> <p>TOTAL DEPTH: 13.40'.</p> | |

WELL COMPLETION INFORMATION

Location Rocky Flats Plant; Solar Ponds Area

Well No. 56-87/SP16-87

Coordinates N 37654.23 E 21319.10

Elevation: Ground Surface 5978.51'

Total Depth: Well 9.92'

Top of Casing 5979.89'

Borehole 13.40'

Formation of Completion Rocky Flats Alluvium

Casing Material Sch 5, Type 316, TFIJ Stainless Steel

Casing Diameter 2" ID

Screen Material 0.010" wire wrap, Type 316, TFIJ Stainless Steel

Surface Casing Diameter 5" ID

Date Installed January 8, 1987

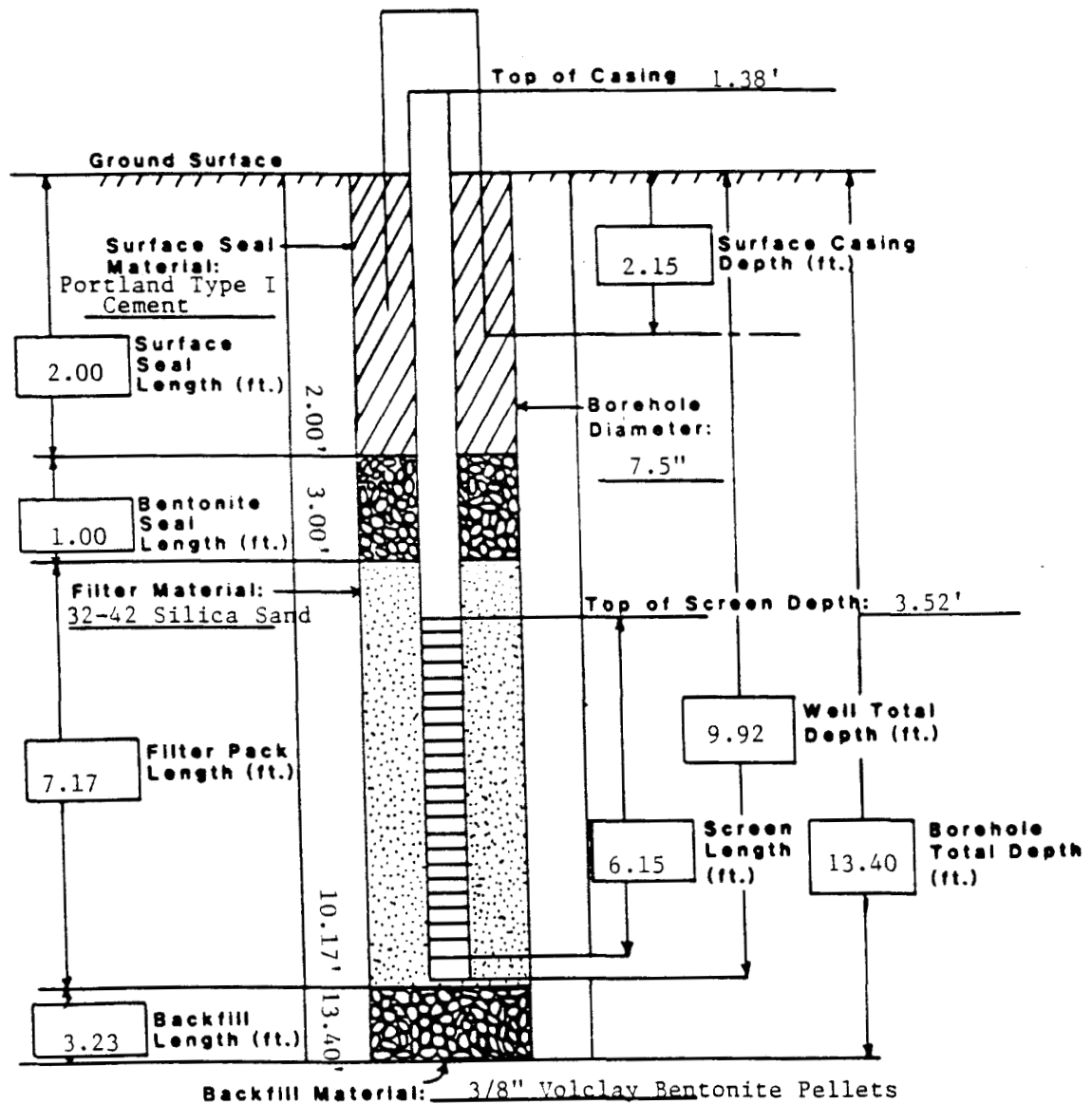
Approved By _____

Installed By K.D. Holliday
Geologist

Site Manager

CEARP Manager

Comments _____



Well No.: 56-87

WELL DEVELOPMENT SUMMARY SHEET

[illegible]

ROCKY FLATS SOLAR PONDS

WATER LEVEL SUMMARY

| <u>WELL</u> <u>NUMBER</u> | <u>DATE</u> | <u>GROUND</u> <u>SURFACE</u> <u>ELEVATION</u> | <u>TOP OF</u> <u>CASING</u> <u>ELEVATION</u> | <u>STICK</u> <u>OF SI</u> <u>UP</u> | <u>DEPTH</u> <u>OF SI</u> <u>BASE</u> | <u>WATER</u> <u>DEPTH</u> <u>BELOW TOC</u> | <u>WATER</u> <u>SURFACE</u> <u>ELEVATION</u> |
|------------------------------|-------------|---|--|---|---|--|--|
| 5687 | 02/29/88 | 5978.51 | 5979.89 | 1.38 | 9.67 | 6.70 | 5973.19 |
| | 03/21/88 | | | | | 7.80 | 5972.09 |
| | 04/18/88 | | | | | 6.70 | 5973.19 |